

SIPHONAPTERA COLLECTED BY MR. ROBIN KEMP IN TROPICAL AFRICA.

BY DR. K. JORDAN AND THE HON. N. CHARLES ROTHSCHILD, M.A.

MR. ROBIN KEMP collected mammals during the years 1910-11 in British East Africa, Uganda, and the adjoining district of the Belgian Congo, and sent us a large collection of parasites which he had secured from some of his mammal captures. No real collection of the Ectoparasites of this district had previously been made, so it is not surprising that the present collection contains many interesting forms and new species.

Mr. Kemp secured thirty-nine species of *Siphonaptera* in all, of which twenty-one are new. Several of these new species have been found on mammals with fossorial habits, and their study has greatly assisted to correct the classification of certain groups of fleas.

In the present paper we have separated some genera from *Ctenophthalmus* and *Leptopsylla*, as a result of the investigation of certain of the species received from Mr. Kemp.

Mr. Kemp's collection comprises two new species of the genus *Ctenocephalus* allied to the common dog-flea. These two—together with *wollastoni* and *rosmarus*, also species from the Ethiopian region—are all the known members of the genus *Ctenocephalus* (apart from *canis* and *felis*), and indicate that Africa is the real home of this genus of fleas. Apart from the common *Ct. canis* and *felis*, no member of this genus is known from any country other than Africa.

In the case of two of the genera we have enumerated all the species known from the Ethiopian region.

1. *Echidnophaga larina* Jord. & Roths. (1906).

Echidnophaga larina Jordan and Rothschild, in Thomps. Yates and Johnst. *Labor. Rept.* vii. 1. p. 49. no. 3. t. 1. fig. 12, t. 2. fig. 18, t. 3. fig. 25 (1906) (Cape Colony, Somaliland, Abyssinia).

1 ♀ from Eusso Nyiro, British East Africa, January 31, 1911.

4 ♀♀ from Masaka, Uganda, April 2, 1911, off a domestic dog.

2. *Echidnophaga gallinaceus* Westw. (1875).

Sarcopsyllus gallinaceus, Westwood, *Ent. Mo. Mag.* xi. p. 246 (1875) (Ceylon).

Echidnophaga gallinaceus, Jord. & Roths., *l.c.*, p. 52, no. 5. t. 1. fig. 1, t. 2. fig. 14, t. 3. fig. 21, t. 4. fig. 27 (1906) (tropical and subtropical districts of Asia and Africa, and Southern U.S.A.).

3 ♀♀ from Taveta, Kilimanjaro, May 12, 1910, off *Mus rattus*.

1 ♂ from Nakurn, British East Africa, September 23, 1910, off *Herpestes* spec.

3. *Echidnophaga aethiops* Jord. & Roths. (1906).

Echidnophaga aethiops Jordan and Rothschild, *l.c.* p. 51. no. 4 (1906) (Namaqualand).

1 ♀ from Voi, British East Africa, April 13, 1910, off a bat.

The second segment of the maxillary pulpus is not quite so short in this specimen as in the type, but is nevertheless shorter than in *E. gallinaceus*. The hindcoxa, moreover, bears a larger number of spiniform bristles than the type-specimen. *E. aethiops* appears to be close to *E. murina* Tirab. (1903), which occurs on rats in Italy.

4. *Pulex irritans* L. (1758).

Pulex irritans Linué, *Syst. Nat.* ed. x. p. 614. no. 1 (1758) (partim); Jord. & Roths., *l.c.* p. 7. no. 1 (1906).

1 ♀ from the Aberdare Mts., British East Africa; no host given.

1 ♀ from Gazi, British East Africa, August 12, 1910; caught in grass.

5. *Xenopsylla somalicus* Jord. & Roths. (1908).

Loemopsylla somalicus Jordan and Rothschild, *Parasitology* i. p. 37. no. 2. t. 3. fig. 8 (1908) (South Somaliland).

The hindtibia bears usually one, occasionally two bristles on the outer surface, but never a series, as in *X. pallidus* Tash. (1889).

1 ♂ and 1 ♀ from Voi, British East Africa, May 14, 1910.

1 ♂ and 4 ♀♀ from Enso Nyiro, British East Africa, January 28 and 29, 1911.

17 ♂♂ and 21 ♀♀ from Nyama Nyango, Enso Nyiro, January 30, 1911.

4 ♂♂ and 6 ♀♀ from Enso Nyiro, February 3, 1911.

Host: *Xerus dabagala rufifrons*, a squirrel.

6. *Xenopsylla cheopis* Roths. (1904).

Pulex cheopis Rothschild, *Ent. Mo. Mag.* (2). xiv. p. 85. no. 4. t. 1. fig. 3, 9, t. 2. fig. 12, 19 (1903) (Shendi).

Loemopsylla cheopis, Jordan and Rothschild, *Parasitology* i. p. 4. no. 6. t. 1, t. 2. fig. 8, t. 4. fig. 8, t. 6. fig. 1 (1908).

1 ♀ from Taveta, Kilimanjaro, May 10, 1910, off *Paraxerus aruscensis*.

1 ♂ and 20 ♀♀ from Nakura, British East Africa, September 22 and 24, 1910, off *Tachyoryctes* spec.

2 ♂♂ from Entebbe, Uganda, March 20, 1911, off the common brown rat.

2 ♂♂ and 1 ♀ from Rnmruti, British East Africa, September 27, 1910, off *Arcicanthis massaicus*.

1 ♂ from Easso Nyiro, British East Africa, January 24, 1911, off *Thamnomys* spec.

7. *Xenopsylla nubicus* Roths. (1903).

Pulex nubicus Rothschild, *Ent. Mo. Mag.* (2). xiv. p. 84. no. 2, t. 2. fig. 10, 16 (1903) (Shendi).

Loemopsylla nubicus, Jordan and Rothschild, *l.c.* p. 46. no. 8. t. 3. fig. 6, t. 4. fig. 6 (1908).

Xenopsylla nubicus, iid., *Nor. Zool.* xviii. p. 64. no. 5. text-fig. 1 (1911).

1 ♀ from Voi, British East Africa, April 16, 1910, off *Tatera osgoodi*.

1 ♂ from Taveta, Kilimanjaro, May 26, 1910, off desert-rat.

8. *Xenopsylla brasiliensis* Baker (1904).

Pulex brasiliensis Baker, *Proc. U.S. Nat. Mus.* xxvii. p. 379 (1904) (São Paulo).

Loemopsylla vigetus Rothschild, *Nor. Zool.* xvi. p. 53. no. 1, t. 8. fig. 3, 4. (1909) (Niger).

Xenopsylla brasiliensis, Jordan & Rothschild, *l.c.* xviii. p. 65. no. 6. text-fig. 4 (1911).

1 ♂ from Voi, British East Africa, April 12 and 16, 1910, off *Tatera osgoodi*.

1 ♂ and 4 ♀♀ from Taveta, Kilimanjaro, May 12 and 24, 1910, off rats.

1 ♀ from Shimbo Hills, British East Africa, July 21, 1910, off *Arcicanthis dorsalis phocotis*.

1 ♂ and 1 ♀ from Gazi, British East Africa, August 20, 1910, off *Paraxerus aruscensis*.

1 ♂ from Nalasanji, Uganda, July 6, 1911, off *Oenomys* spec.

1 ♂ and 1 ♀ from Kigezi, Uganda, April 12, 1911, off *Arvicanthus abyssinicus rubescens*.

1 ♀ from Naivasha, British East Africa, September 17, 1911, off the same host.

9. *Xenopsylla niloticus* Jord. & Roths. (1908) (text-figs. 1 and 2).

Loemopsylla niloticus Jordan and Rothschild, *Parasitology* i. p. 50. no. 12. t. 5. fig. 3 (1908) (Upper Egypt and Sudan).

The present series of specimens has drawn our attention to a rather striking distinction of this species which we did not mention in our original description. The eye of *X. niloticus* (text-fig. 1) is much smaller than in the allied species, even being vestigial on one side of the head in one of the specimens obtained by Mr. Kemp.

The genitalia of the ♂♂ appear to vary to some extent. The "finger" is so much longer in one of the specimens than in the others that we thought at the first the individual belonged to a distinct species. But as the specimen, in other respects, has all the characteristics of *X. niloticus*, we are inclined to

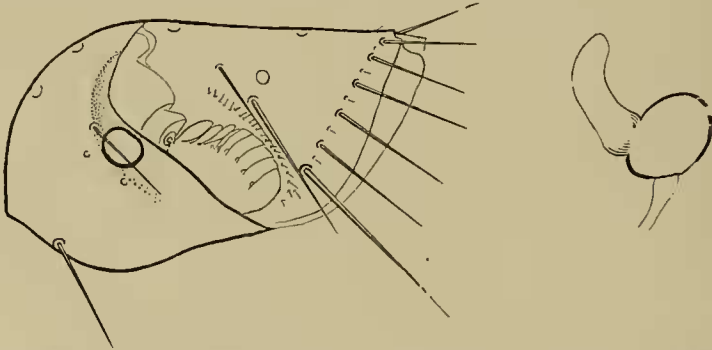


FIG. 1.—Head of *Xenopsylla niloticus* ♂.

FIG. 2.—Receptaculum seminis of *X. niloticus*.

consider it as an abnormal individual. The ninth abdominal sternite of the ♂ also varies, being broader at the apex in some examples than in others.

The receptaculum seminis has a very characteristic shape (text-fig. 2, taken, like fig. 1, from a Sudanese specimen).

A series of both sexes from :

Voi, British East Africa, April 10 and 18, 1910, off *Tatera mombasae* and *Tatera nigricauda*.

Kilimanjaro, May 12 to 16, 1910, off *Tatera nigricauda*.

Mt. Kenia, December 6, 1910, off *Oenomys bacchante*.

Nyama Nyango, Eusso Nyiro, February 3, 1911, off *Tatera nigricauda nyama*.

10. *Xenopsylla isidis* Roths. (1903).

Pulex isidis Rothschild, *Nor. Zool.* x. p. 343. no. 2. t. 5. fig. 2, 5, 6, 8 (1903) (Harar).

Loemopsylla isidis, Jordan & Rothschild, *Parasitology* i. p. 56. no. 16. t. 2. fig. 16, t. 4. fig. 11, t. 6. fig. 3 (1908).

Xenopsylla isidis, iid., *Nov. Zool.* xviii. p. 65. no. 7 (1911).

4 ♂♂ and 4 ♀♀ from Mt. Elgon, British East Africa, off *Procarvia daemon*.

This is a new locality for the species.

11. *Ctenocephalus conversus* spec. nov. (text-figs. 3, 4, and 5).

♂♀. Mr. Kemp obtained both sexes of a species very closely allied to *Ct. wollastoni* Roths. (1908), described from two ♂♂ collected by Dr. A. F. R.

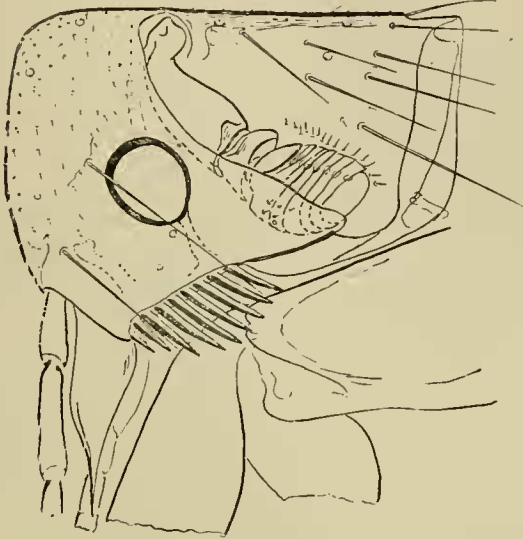


FIG. 3.—*Ct. conversus* ♂.

Wollaston on the Ruwenzori Mts. The new species differs from *wollastoni* in the genal comb only containing seven to nine spines instead of ten or eleven, and in the shape and armature of the modified abdominal segments.

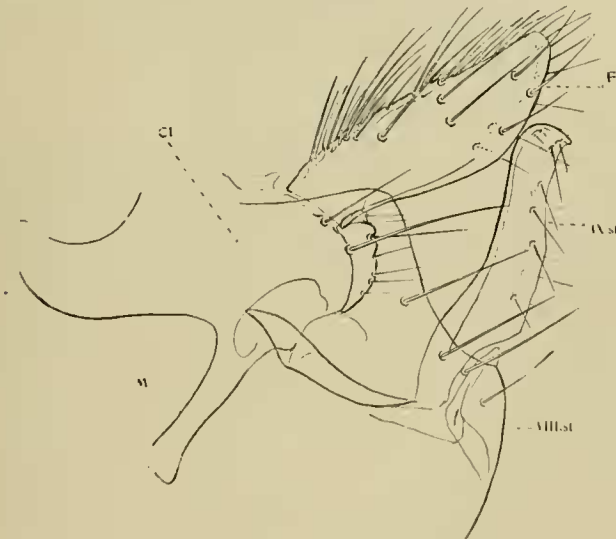


FIG. 4.—*Ctenocephalus conversus*.

♂. The eighth sternite is less evenly rounded at the apex than in *Ct. wollastoni*, and bears a subapical row of four long and two shorter bristles (on each side)

besides two or three small ventral bristles (text-fig. 4). The large movable flap of the clasper (F) is three times as long as it is broad at the widest point (45 : 14), being longer and a little narrower than in *wollastoni*. The long bristles situated on this flap are slightly less numerous than in *wollastoni*, and the small bristles, of which there are ten to twelve in the middle area near the dorsal margin on the inner surface of the flap in *wollastoni*, are replaced in the new species by two to four slender bristles. The ninth sternite, which is rounded at the apex of the ventral arm in *wollastoni*, has this apex rounded dorsally, but angulate ventrally in the new species (IX. st.). Moreover, the bristles on this segment are much less numerous than in *wollastoni*.

♀. The dilated ventral portion of the eighth tergite (text-fig. 5, VIII. t.) is divided by a round apical sinus into a pointed upper lobe and a broader and rounded lower one. The upper portion of this ventral lobe is internally incrassate, and bears at the apical margin five thin bristles, of which two are short, and near the margin on the outer surface a transverse row of four long ones. The

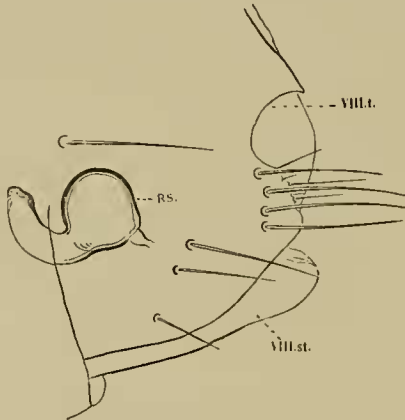


FIG. 5.—*Ctenocephalus conversus*.

segment has, in addition, three bristles more proximal and more ventral in position, and one long one further up the side. The eighth sternite, which is small and elongate, does not bear any bristles. The stylet is very slender, conical, being four times as long as it is broad at the base. The receptaculum seminis (R.S.) has a globular head, which is shorter than the tail.

Length (mounted specimens): ♂ 2.6 mm, ♀ 3.3 mm.

1 ♂ (type) from Mutaragwa, Aberdare Mts., British East Africa, March 15, 1910, off *Lophuromys testudo*.

1 ♀ from Mutaragwa, March 17, 1910, off *Dendrohyrax crawshayi*.

1 ♂ from Mutaragwa, March 23, 1910, off *Genetta stuhlmanni*.

12. *Ctenocephalus craterus* spec. nov. (text-figs. 6, 7, and 8).

♂ ♀. A most interesting species, which connects the preceding one with *Ct. canis* and *felis*. In the high head, the position of the eye, the length of the maxillary and labial palpi, and the size of the antennae, *Ct. craterus* resembles *Ct. wollastoni* and *conversus*, but it agrees with *Ct. canis* and *felis* in the position

and greater length of the genal spines, the presence of a spine at the apex of the genal process, and the structure of the modified abdominal segments.

Head.—The frons is not quite so abruptly rounded as in *Ct. wollastoni* and *conversus*, but much the greater part of the anterior margin is nevertheless vertical (♂, text-fig. 6) or subvertical (♀). An internal incassation extends from the oral frontal corner obliquely upward as in *Ct. felis* and *canis*, being, however, much shorter in the ♂ of *craterus* than in those species. The eye is well removed from the genal comb, being placed at two-fifths of the distance from the comb to the vertex. There are two long bristles on the frons, one before the eye and the other near the oral frontal corner. The comb commences at this corner as in *canis* and *felis*, and consists of seven (rarely six) long and sharply pointed spines. The occiput bears one long bristle behind the base of the antennal groove, a long and a short one in the middle, and a row of four (on each side) near the apex. The ♀ has no

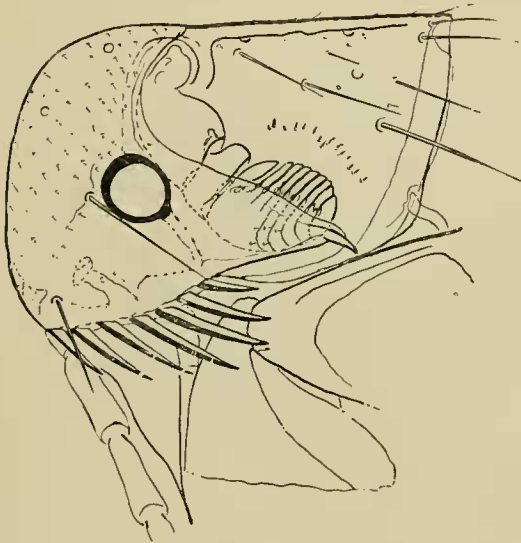


FIG. 6.—*Ctenocephalus craterus* ♂.

small bristles above the antennal groove, while the ♂ has here a row of about fifteen. The rostrum reaches to the apical fourth of the forecoxa, the first segment of the labial palpi being at least half as long again as segments 2 and 3 together.

Thorax.—The pronotum has a comb of sixteen to eighteen pointed spines, the dorsal spines being slightly depressed. There is one row of bristles, containing twelve on the two sides together, on all three thoracic nota. The mesonotum, in addition, bears many small bristles at the base, arranged in one row laterally and in several irregular rows dorsally, these bristles occurring dorsally in both sexes from the base to near the row of long bristles. The mesopleura have six or seven bristles, of which the one placed above the stigma is very long. The metepisternum has one or two bristles (usually two) and the metepimerum twelve to sixteen in two rows (6, 6—or 7, 6—or 8, 7—or 8, 8).

Abdomen.—In the ♀ the stigmata are as large as in the ♂ of *canis*, being slightly smaller in the ♂. The tergites of ♂ and ♀ bear one row of bristles con-

taining (on the two sides together) on the anterior segments ten to twelve and on the posterior ones eight to ten bristles, the first tergite, however, having two rows of four bristles. The antepygidial bristle is a very little shorter than the second hindtarsal segment. The sternites have few bristles in both sexes, the numbers being two to four in the ♂ and three or four (rarely five) in the ♀, segment VII. of the ♀ usually having one or two more bristles than the preceding segments.

Legs.—The coxae are similar in shape to those of *Ct. felis* and *canis*. The hindcoxa bears eleven to fifteen stout short spiniform bristles on the inner surface and three bristles on the posterior apical lobe. The hindfemur has two subapical ventral bristles on the outside and a row of three to five on the inner surface. The hindtibia has five dorsal notches, exclusive of the apical one, and on the outer surface a row of eight to ten bristles, besides six to eight placed along the anterior edge. The longest apical bristle of the first hindtarsal segment often reaches to the apex of the second segment, and the corresponding bristle of the second segment

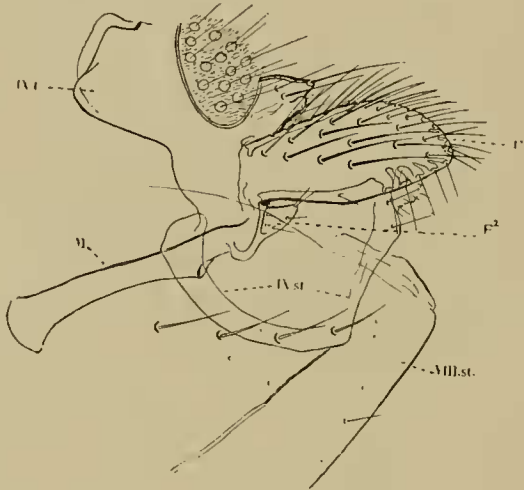


FIG. 7.—*Ctenocephalus craterus*.

frequently extends to the apex of the fourth. The measurements of the mid- and hindtarsi are as follows :

Midtarsus : ♂ 21, 28, 18, 11, 31 ; ♀ 27, 34, 20, 13, 35.

Hindtarsus : ♂ 59, 33, 21, 14, 33 ; ♀ 67, 39, 23, 16, 38.

The proportions vary a good deal in the specimens of different size.

Modified Segments.—♂. The eighth sternite (text-fig. 7) has an oblique sub-apical row of three or four bristles and one ventral bristle, besides some minute hairs. The internal portion of the ninth tergite is broader than long, being truncate, with the upper angle about 90° and the lower angle very strongly rounded (IX. t.). The manubrium (M) and the two flaps of the clasper bear a remarkably close resemblance to these organs of *Ct. canis*. The bristles on the outer surface of the large flap F¹ are more numerous and the small flap F² is narrower than in *canis*. The outline of the distal portion of the ninth sternite is so much obscured in the specimen from which the figure is taken that we cannot make it out clearly.—♀. The eighth tergite, which has no bristles above the stigma, bears from eight

to fourteen lateral bristles and on the outer side an apical row of eight or nine, rarely as few as six, while there are on the inside three apical bristles and eight somewhat stouter subapical ones. The stylet is strongly conical, being two and a half times as long as it is broad at the base. The bristles of the anal sternite are apical and subapical, as in *canis* and *felis*. The head of the receptaculum

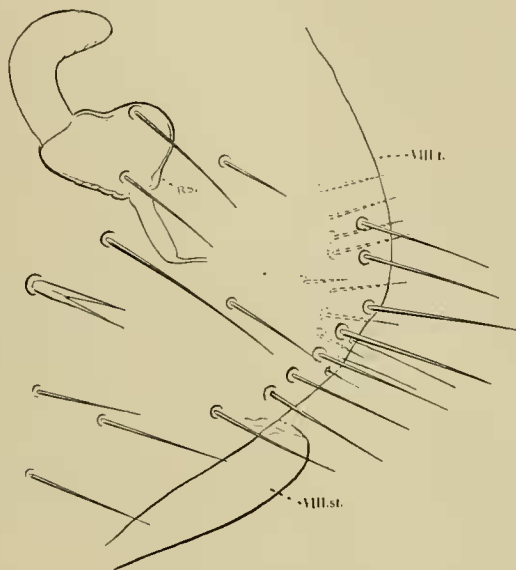


FIG. 8.—*Ctenocephalus craterus*.

seminis (R.S.) is much shorter than the tail; it is widest proximally and incurved dorsally at a short distance from the tail.

Length (mounted specimens): ♂ 2·10 mm., ♀ 2·9 to 3·6 mm.

8 ♂♂ and 29 ♀♀ from Mutaragwa, Aberdare Mts., British East Africa, March 15–17, 1910, off *Dendrohyrax crawshayi*.

1 ♀ from Mutaragwa, March 23, 1910, off *Genette stuhlmanni*.

1 ♀ from Mt. Kinangop, Aberdare Mts., February 27, 1910, off *Arvicanthiis pumila*.

The true host appears to be *Dendrohyrax crawshayi*.

13. *Ctenocephalus canis* Curtis (1826).

Pulex canis Curtis, Brit. Ent. iii. No. 114. figs. A–E and 8 (1826); Roths., l.c. (1905).

6 ♂♂ and 13 ♀♀ from Voi, British East Africa, April 27, 1910, off *Canis lateralis*.

9 ♂♂ and 12 ♀♀ from Taveta, Kilimanjaro, May 5, 1910, off *Lepus* spec.

11 ♂♂ and 22 ♀♀ from Rumruti, British East Africa, October and November 1910, off *Euxerus erythropus*.

2 ♂♂ and 2 ♀♀ from Rumruti, off *Epimys jacksoni*.

14. *Ctenocephalus felis* Bouché (1835).

Pulex felis Bouché, *Nova Acta Ac. Leop. Carol.* xvii, p. 505. No. 4 (1835); Roths., *Nor. Zool.* xii, p. 192 (1905) (differences between *canis* and *felis*).

3 ♂♂ from Eusso Nyiro, British East Africa, January 30, 1910, off *Tachyoryctes ruddi*.

5 ♂♂ and 12 ♀♀ from Voi, from British East Africa, April 16, 1910, off *Mungos ichneumon funestus*.

3 ♂♂ and 16 ♀♀ from Rumrnti, British East Africa, October 20 and 27, 1910, off *Lepus victoriae*.

6 ♂♂ and 11 ♀♀ from Rumrnti, British East Africa, October 1910, off *Dendrohyrax crawshayi*.

1 ♂ from Rumrnti, off *Euxerus erythropus*.

3 ♀♀ from Masaka, Uganda, April 2, 1911, off domestic dog.

1 ♀ from Kagamba, Uganda, July 14, 1911, off man.

Also long series taken at Mombasa from the blankets and beds of natives, July 6, 1910, at Mazeras, British East Africa, off a negro and goats on July 3 and 4, 1910, and on the ground in a Masai Kraal at Laikipia, British East Africa, October 25, 1910.

15. *Ceratophyllus incisus* spec. nov. (text-fig. 9).

♀. Mr. Kemp collected a number of specimens of a species of *Ceratophyllus*, all ♀♀, which agrees well with *C. fasciatus* except in the smaller number of bristles

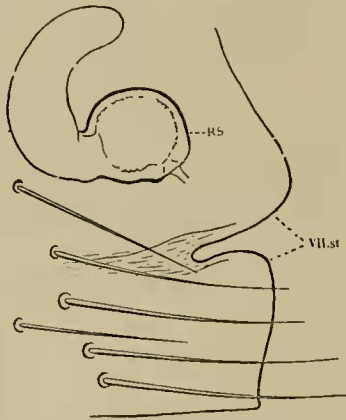


FIG. 9.—*Ceratophyllus incisus*.

on the abdominal sternites and in the shape of the seventh sternite. As in *fasciatus*, the rostrum reaches to the trochanter, the occiput bears one median bristle, not two, and the forefemur a number of small bristles on the outer surface. The comb consists of nineteen to twenty-two teeth. The bristles number six to eight on the sternites of the third to sixth abdominal segment on the two sides together, and on the seventh sternite eight to thirteen. This sternite is divided by a narrow sinus of slightly variable depth into a rounded-triangular upper lobe and a broader truncate

lower one, the segment being more strongly chitinated around the sinus than elsewhere. The eighth tergite has two long bristles below the stigma accompanied by a minute hair, two or three at the apical margin and eight or nine further proximally; on the inside the segment has one apical bristle and a subapical row of three, all short, but almost as stout as the long bristles of the outer surface. The receptaculum seminis resembles that of *C. fasciatus*; the tail narrows perceptibly towards the apex and the head is reticulated on the outer surface,

2 ♀♀ from Mt. Kinangop, Aberdare Mts., British East Africa, February 25, 1910, off *Oenomys bacchante*; type.

14 ♀♀ from Mutaragwa, Aberdare Mts., March 1 to 14, 1910, off *Thamnomys ibeanus*, *Lophuromys zena*, and *Graphiurus microtis saturatus*.

1 ♀ from Aberdare Mts., March 1910, off *Cryptolopha mackenziana*.

1 ♀ from Buhamba, Congo, June 4, 1911, off *Thamnomys dryas*.

16. *Ceratophyllus infestus* Roths. (1908) (text-figs. 10 and 11).

Ceratophyllus infestus Rothschild, in *Sjöstedt, Kilimandjaro-Meru Exped.*, Siphonaptera, p. 4. t. 1. fig. 6. 7 (1908) (Kibonoto).

As the original figures of *C. infestus* have slightly suffered in reproduction, we take the opportunity of supplementing them with two additional figures taken from the type (♂) and a paratype (♀). The genitalia vary slightly in detail. The type

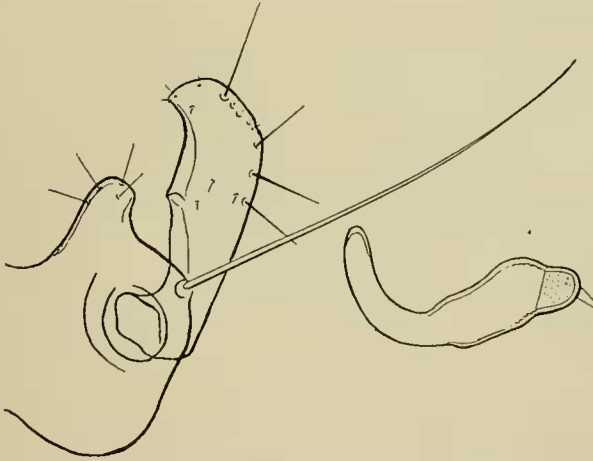


FIG. 10.—*Ceratophyllus infestus*.

FIG. 11.

bears a small hair below the long bristle of the clasper on one side of the body, but not on the other. This hair is absent from the examples collected by Mr. Kemp. The receptaculum seminis (text-fig. 11) is remarkable for its slender shape and projecting mouth.

7 ♀♀ from Mt. Kenia, December 2, 1910, off a squirrel, *Heliosciurus keniae*.

17. *Pygiopsylla afer* Roths. (1908).

Pygiopsylla afer Rothschild, *Proc. Zool. Soc. Lond.* p. 618. no. 1. t. 29. fig. 7. 8 (1908) (Angola).

1 ♀ from Kagamba, Uganda, July 14, 1911, off *Dasymys medius*.

Xiphiopsylla gen. nov.

♂ ♀. The bristles of the head, pro- and mesonotum small, those of the post-median row on the abdominal segments and metanotum long, generally of nearly the same width to near the tip, or even slightly widened distally, the tip not drawn out into a long thin point, these bristles closely resembling a straight sword.

Eye vestigial, quite small and only distinct in optical section, without any pigment. Frontal tubercle triangular in a lateral view, pointed, distinctly projecting downwards; oral angle of frons more strongly produced ventrad than is usual, forming a conspicuous hook in a side view. Genal lobe very broad. Antennal groove of ♀ not continued to the vertex. Maxillary palpus very long and slender, reaching beyond the apex of the forecoxa and being longer than the labial palpus, which consists of five segments.

Pronotum long, with more than one row of bristles, and a comb of sixteen or less spines, the latter not placed close together. The comb is situated at a considerable distance from the ventral edge of the pronotum. Mesonotum without subapical spines on inside. Episternum of the metathorax higher than long.

One antepygidial long bristle in both sexes. In the ♂ the anal tergite separated from the "pygidium" by a distinct suture; the ninth sternite without internal vertical arm, and the eighth sternite large.

Genotype: *X. hippia* spec. nov.

Allied to *Ceratophyllus*, of which it is an offshoot.

18. *Xiphiopsylla hippia* spec. nov. (text-fig. 12, 13 and 14).

♂ ♀. Very strongly chitinated. On the abdomen the chitin is thickest in the centre of the segments, the skeleton appearing very thick on the back and venter in a lateral view. The greater part of the specimen is conspicuously reticulated, the meshes being smaller and more regular in the strongly chitinated portions of the body. Moreover, the abdominal tergites and the posterior halves of the sternites are densely denticulated, and the meso- and metanotum, metepimerum and the abdominal segments I, to VII. have serrate apical edges. The long bristles of the abdomen are shaped like a sword, the lateral ones being faintly widened before narrowing to a point.

Head.—The frons is evenly rounded in the ♂ (text-fig. 12), the occiput being horizontal. In the ♀ the dorsum of the occiput slants forward and the frons is less strongly curved than in the ♂. There is a row of six bristles extending from the maxillary palpus obliquely upwards to the antennal groove, and further down a row of three or four bristles, of which the upper one is placed in front of the vestigial eye, an additional fairly long bristle being situated near the antennal groove between the two rows. These bristles vary in length, but the most ventral one is always the longest. The occiput has a few small bristles along the antennal groove, the approximate numbers being six in the ♂ and eight in the ♀. The lateral bristles of the occiput as well as those of the subapical row are exceptionally short, the lateral ones as a rule being arranged in three sets (usually 1, 2 or 3, 1). The first segment of the antenna and the club are very long and slender in the ♂, and the bristles of the first and second segments quite short in both sexes. The proportional lengths of the segments of the maxillary palpus are: 21, 15, 16, 23.

Thorax.—The pronotum bears two rows of short bristles. The comb contains fourteen spines, and the distance from the first spine to the ventral edge of the

pronotum about equals the interspace between the first and fifth spines. The lengths of the three thoracic tergites are subdorsally 24, 30, 25. The metepisternum is very much higher than it is long. The lower half of the distal margin of the metepimerum is incurved, so that the apex of this sclerite is almost pointed; the dorsal portion of the apical margin is rounded, the outline being, however, slightly variable. The metepimerum has two or three long bristles below the stigma, and in front of this row about eight or nine small ones, irregularly distributed.

Abdomen.—The tergites I to VI in ♂ and I to V in ♀ bear dorsally on the two sides together two to four apical spines. The postmedian row of long bristles contains about twenty-four bristles on the two sides together. The small bristles placed between the long ones are very thin, while the short bristles which are placed in front of the long ones, and of which there are one to three rows, are remarkably



FIG. 12.—*Niphiopsylla hippia* ♂.

thick. The row of long bristles curves backwards dorsally, and the second to fourth short lateral bristles of the second segment point obliquely downwards. The basal sternite has ventrally one pair of bristles and some very minute hairs, the following sternites bearing on the two sides together a row of twenty to twenty-four long bristles, and a small number of additional shorter bristles.

Legs.—The bristles on the coxae, femora, and the outside of the tibiae are small. The subapical posterior sinus of both the mid- and hindcoxae is small and nearly semicircular, the angle above the sinus is prominent, as the hindmargin of the midcoxa is rather abruptly incurved above this angle and that margin of the hindcoxa gently incurved from the angle to beyond the centre. The apical lobe is broad in both these coxae. The forefemur has several small hairs on the outer surface. The hindfemur bears six or seven subventral hairs on the outside, inclusive of the subapical bristle. The mid- and hindfemora have six or seven

pairs of stout dorsal bristles situated in notches, inclusive of the apical pair. The longest bristle of the second hindtarsal segment does not reach the apex of the fourth segment. The measurements of the tarsi are as follows:

Midtarsus: ♂ 22, 17, 12, 9, 22; ♀ 21, 16, 11, 8, 20.

Hindtarsus: ♂ 54, 30, 16, 10, 24; ♀ 50, 26, 14, 9, 21.

Modified Segments.—♂. The eighth tergite (text-fig. 13) has the lower apical angle drawn out into a point, and bears five or six short thick bristles above the stigma, and thirteen to fifteen much longer ones below it (only the apical ones being drawn in our figure). The eighth sternite is about one-fourth longer than it is wide dorso-ventrally, bearing twenty-six to thirty bristles, of which one situated beyond the centre of the ventral margin is very long, being drawn out.



FIG. 13.—*Xiphiopsylla hippia*.

into a long thin point. The dorsal outline of the sensory pygidial plate is nearly straight, but the hind edge of the plate projects backwards, because the anal tergite is hollowed out dorsally. This groove extends across the segment, and is densely clothed with very thin hairs. The clasper (Cl) has a very slender manubrium (M), which bears a groove along the upperside and very slightly bends upwards at the end. Above the insertion of the movable process (F) the clasper is produced into a very short, almost rectangular process (P), which bears two long bristles and one short one. There are no bristles on the clasper near the insertion of the "finger" (F). The latter process is very long and very slender, being of nearly the same width throughout, except for tapering to a point at the apex, which is slightly curved upwards. The two halves of the ninth sternite (IX. st.) are united from the base to the centre, and have one long wire-like internal lever. The distal

portion is claviform, and each club bears on the outer surface numerous short, stout spines, which point downwards. Near the base of the handle of each club there are two or three slender bristles. There is no vertical arm to the ninth sternite.—♀. The seventh tergite is produced into a lobe below the long antepygidial bristle; the sternite (text-fig. 14, VII. st.) is longitudinally striated like the eighth segment and the ventral and apical portions of the seventh tergite, and gradually narrows towards the apex, which is truncate, and bears a small sinus. The eighth tergite (VIII. t.) has three to five minute hairs above the stigma, and about as many just below it. The ventral margin of this segment bears six to

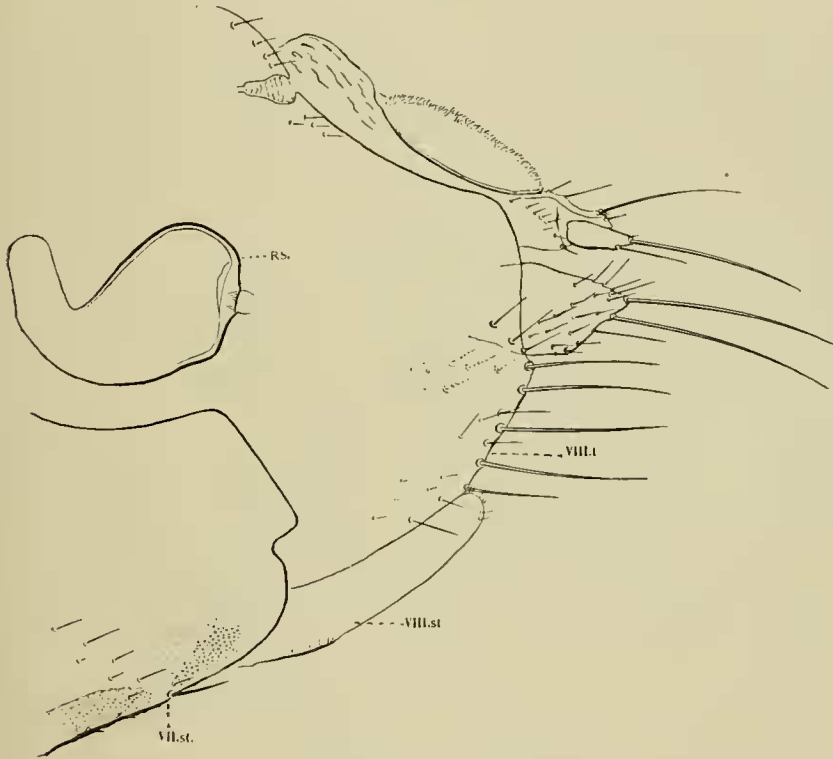


FIG. 14.—*Xiphiopsylla hippia*.

eight fairly long but very slender bristles, there being about twelve small hairs at and near the ventral margin, and a patch of six or seven on the inside of the segment. The pygidial plate is more convex than in the ♂, but does not project posteriorly on account of the anal tergite being but very feebly concave near the base. The anal tergite is obtuse, and bears on each side two long slender bristles, all the other bristles being short and thin. The stylet is not quite three times as long as it is broad, being bottle-shaped, and bearing a long apical bristle and two short subapical ones, of which the dorsal one is quite small. The receptaculum seminis has a very large truncate head and a short tail, and resembles to some extent a fig, the head being shorter in the second specimen than in the one figured.

Length (mounted specimens): ♂ 2·8–3 mm.; ♀ 3–3·2 mm.

1 ♂ and 2 ♀ ♀ from Mutaragwa, Aberdare Mts., British East Africa, March 1–14, 1910, off *Lophuromys zena*.

1 ♂ (type) from Mutaragwa, March 21, off *Epinomys jacksoni*.

1 ♂ and 2 ♀ ♀ from Mt. Kinangop, Aberdare Mts., February 23, 1910, off *Tachyorystes audax*.

1 ♀ from Solai, Mt. Kenia, December 5, 1910, off *Lophuromys zena*.

1 ♂ from Mt. Kenia, December 8, 1910, off the same host.

1 ♂ from Mt. Kenia, December 6, 1910, off *Otomys irroratus elgonis*.

19. *Xiphiopsylla hyperetes* spec. nov. (text-fig. 15).

♂ ♀. The reticulations of the body and the denticulation of the ridges are very much less pronounced than in *hippia*, the skeleton of the abdomen is not distinctly incrassate dorsally and ventrally, the lobe of the pronotum situated below the comb

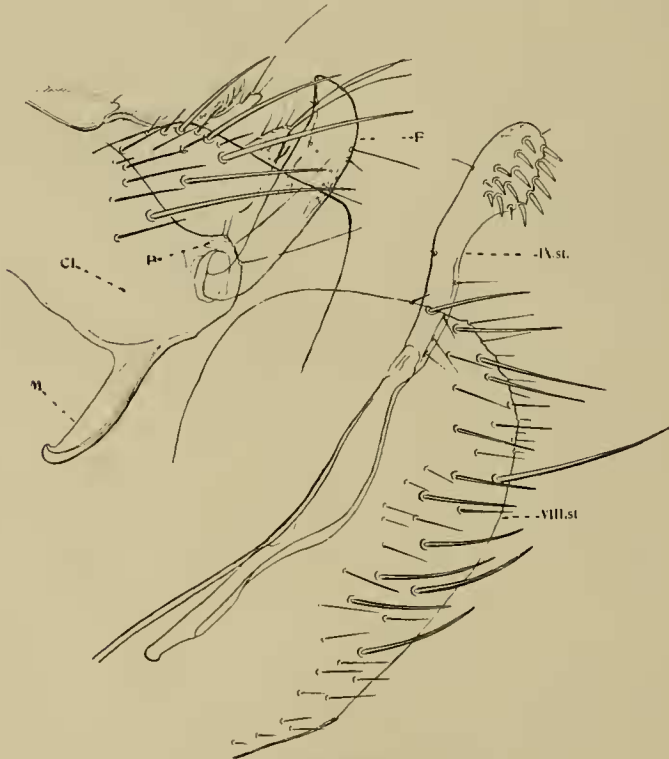


FIG. 15.—*Xiphiopsylla hyperetes*.

and the metepisternum are much broader, the lower angle of the genal process projects much more, and the small bristles of the abdomen are much thinner than in *hippia*. The postmedian row of bristles on the tergites does not curve so distinctly backwards dorsally, and contains a few bristles less; the corresponding row of the sternites consists of only fourteen or less bristles, the small bristles in front of the row of long ones form four to six rows dorsally on the tergites, the

hind edge of the hindcoxa is more rounded, and the angle above the sinus therefore less pointed; and the modified abdominal segments also are different. The pronotal comb contains sixteen spines.

Modified Segments.—♂. The eighth tergite bears, above the stigma, about a dozen bristles, which are much thinner than in *X. hippia*. The portion of the segment below the stigma is apically truncate, with the lower angle hardly at all produced, and bears altogether about sixteen bristles, of which seven or eight are long. The eighth sternite is longer and apically more rounded than in *X. hippia*, being widest beyond the centre, and bears a much larger number of bristles (about fifty on each side). The longest of these bristles is placed at the ventral margin in the neighbourhood of the apex. The upper inner angle of the ninth tergite is pointed (in lateral aspect) and the manubrium shorter than in *X. hippia*. The short process (P) of the clasper is rounded, the finger (F) broader and shorter than in that species, and the ninth sternite somewhat different in shape. The dilated apex of this segment is longer than in *X. hippia* and the spines are fewer in number.—

♀. The seventh tergite bears below, and posterior to, the long antepygial bristle, two or three short ones. The seventh sternite is broader than in *hippia*, rotundate-truncate, and does not bear a sinus. The eighth tergite has about twelve small bristles above the stigma and four below it. The ventral portion of this sclerite is truncate at the apex, with the angles rounded, and bears along the ventral edge five or six bristles accompanied on the inside by four small ones; above the most distal marginal bristles there are two smaller ones, the lateral outer surface bearing about ten to twelve small bristles, and the inner surface seven or eight slightly stouter ones. The stylet and the anal sternite are longer than in *hippia*, and the bristles at the apex of the latter much more numerous. The receptaculum seminis is remarkably different, closely agreeing with that of the next species. It is much more strongly chitinated, the head asymmetrically ovate with the mouth produced.

Length: ♂ (mounted) 3.9 mm.; ♀ (not mounted) 4.1 mm.

1 ♂ from Mutaragwa, Aberdare Mts., British East Africa, March 1 to 14, 1910, off *Lophuromys zena*.

1 ♀ from Mt. Mikeno, Belgian Congo, off *Lophuromys spec.*

20. *Xiphiopsylla apriona* spec. nov. (text-fig. 16).

♀. Similar to *X. hyparetis*, but at once distinguished by the apices of the abdominal segments not being serrate.

There is no regular reticulation even on the more incrassate central parts of the abdominal segments, nor are the ridges denticulate as in the two preceding species.

The lower angle of the genal process is much more rounded than in *X. hyparetis*. The pronotal comb contains only twelve spines, the lobe below the comb being broader (in a vertical sense) than the pronotum, exclusive of the comb, is long dorsally. The proportional lengths of the pro-, meso- and metanota are 24, 40, 30. The long bristles of the abdominal tergites are distally slenderer than in the previous species, but still resemble a straight sword, whereas the bristles of the sternites taper gradually from the base to the tip, not differing from ordinary bristles. The postmedian row of the sternites contains at most twelve bristles. The small bristles placed in front of the postmedian row of the tergites are less

numerous than in *X. hyparetes*. The seventh tergite bears only one short bristle below the long autepygidial one. The seventh sternite is as broad as in *X. hyparetes*, but is more rounded and is not longitudinally striated like the eighth tergite, but vertically, the lines on the apical area of the segment being very close together. The eighth tergite has about a dozen small bristles above the stigma and four to eight below it; its apex is more rounded than in *X. hyparetes* and *hippia*. The bristles on the ventral portion of this sclerite agree with those of *X. hyparetes*,

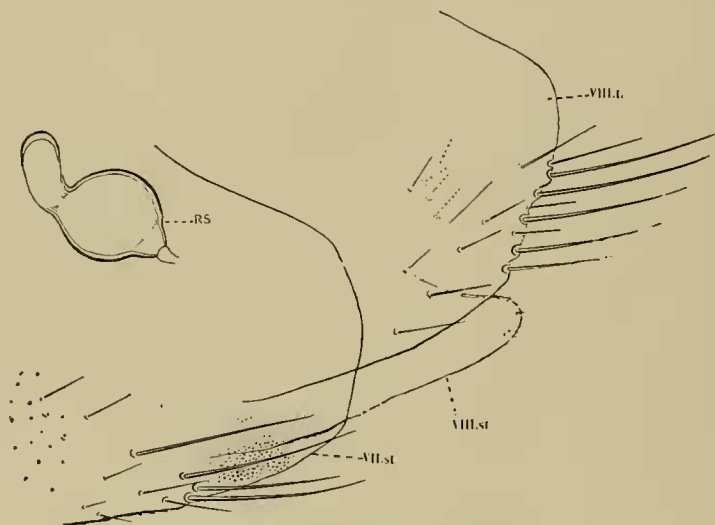


FIG. 16.—*Xiphiopsylla apriona*.

except that there are less on the inner surface. There is also no essential difference in the anal segment between these two species. The receptaculum seminis likewise is nearly the same as in *hyparetes*.

3 ♀♀ from Mt. Kenia, British East Africa, December 14 and 15, 1910, off *Tachyoryctes* spec.

21. *Listropsylla dolosus* Roths. (1907).

♀. *Listropsylla dolosus* Rothschild, *Ent. Mo. Mag.* (2) xviii. p. 175. no. 2 (1907) (Kikuyu Escarpment Brit. E. A.).

Mr. Kemp obtained both sexes of this species. The ♂ almost exactly agrees with *L. stygius* Roths. (1908), described as *Ceratophyllus stygius* in *Ent. Mo. Mag.* (2). xix. p. 77. no. 3. t. 1. fig. 3 (1908) from a single ♂ collected by A. F. R. Wollaston on the Ruwenzori Mts. The "finger," however, is slightly different in the two forms, being broader in *stygius* than in *dolosus*. In *dolosus* the long ventral bristle of the "finger" is placed at three-fifths, and in *stygius* at two-thirds, i.e. the distance from the base of the "finger" to the bristle is in *stygius* twice as long and in *dolosus* half as long again as the distance from the bristle to the apex of the "finger." The two insects are presumably geographical forms of the same species. Both in *dolosus* and *stygius* the ventral genal margin bears some short, flat, cordiform teeth, and the first midtarsal segment is twice as long as the second.

1 ♀ from Mutaragwa, Aberdare Mts., British East Africa, March 13, 1910, off *Graphiurus microtis saturatus*.

1 ♀ from Mutaragwa, March 24, 1910, off *Dendromys nigrifrons*.

2 ♂♂ from Mutaragwa, March 4, 1910, off *Epimys jacksoni*.

1 ♀ from Mt. Kenia, December 1910, off *Lophuromys* spec.

1 ♂ and 2 ♀♀ from Mt. Kenia, December 1910, off *Epimys medicatus*.

1 ♀ from Mt. Kenia, December 1910, off *Arvicanthis* spec.

1 ♂ from Mt. Kenia, December 1910, off *Otomys irroratus elgonis*.

1 ♂ from Kilimandjaro, May 13, 1910.

1 ♂ from Kigezi, Uganda, April 9, 1911, off *Lophuromys* spec.

2 ♀♀ from Kigezi, April 25, 1911, off *Arvicanthis* spec.

1 ♀ from Kigezi, April 26, 1911, off *Lophuromys* spec.

Ctenophthalmus Kolen. (1856).

The genus appears to be very abundantly represented in Africa south of the Sahara. The species from tropical Africa, however, though undoubtedly closely related to some of the Palaearctic forms, do not exactly conform to the generic diagnosis based on the European species. The number of plantar bristles present on the fifth segment of the hindtarsus is generally considered of taxonomic value in *Ctenophthalmus* and allied genera, being quite constant in the European species. The Ethiopian *Ctenophthalmus*, however, prove that one must not lay too much stress on a single character of this kind. Only one of the nine species of *Ctenophthalmus* from tropical Africa has three pairs of lateral bristles on that tarsal segment, as in all the European species, the other forms bearing three bristles on one side of the segment and four on the other, or four on both sides, or three pairs on one hindtarsus and three and a half pairs on the other, the numbers fluctuating within the same species and sometimes being different on the right and left hindtarsus of the same individual. The European *Ctenophthalmus*, with the exception of *Ct. rettigi* Roths. (1908), moreover, are characterised by bearing a curved hair at the tip of the labial palpi, which is not the case in any tropical African form. All of them, however, have the three genal spines typical of this genus, a pointed frontal tubercle situated in a groove, a vestigial eye, two rows of bristles on the frons, a short pronotum bearing one row of bristles, etc. The hind-coxa has no patch or row of spines on the inside, and the fifth segment of all the tarsi bears a ventral proximal pair of bristles in between the first lateral pair.

Four species of *Ctenophthalmus* have been described from Africa south of the Sahara: *calceatus* Waterst. (1912), *ansorgei* Roths. (1907), *engis* Roths. (1907), and *triodontus* Roths. (1907). "*Typhlopsylla*" *ingens* Roths. (1900), as pointed out on p. 562 of the present paper, does not belong to the genus *Ctenophthalmus*.

A. Proboscis reaching close to apex of forecoxa; three or four bristles beneath stigma on abdominal tergites II and III; longest apical bristle of second hind-tarsal segment reaching beyond apex of fourth segment; surface-sculpture faint, particularly weak on the legs; metepimerum with more than ten bristles.—These characteristics sharply distinguish *Ct. triodontus* and a nearly allied new species from all the other African ones.

22. *Ctenophthalmus audax* spec. nov. (text-figs. 17 and 18).

In this species and *C. triodontus* the bristles are more numerous than in any other tropical African species. *Ct. audax* is differentiated from *Ct. triodontus* in the ♂ by the movable process of the clasper not being abruptly dilated distally, and in the ♀ by the basal abdominal sternite bearing a number of lateral bristles.

Head.—The first and second genal bristles are much shorter and more obtuse than the third, the second one being especially blunt. The frons bears two rows of bristles and the occiput three rows.

Thorax.—The pronotal comb consists of sixteen spines. The two lower bristles of the pronotal row are much closer together than the other bristles of the same row. The mesopleura bear eleven or more bristles, the metepisternum has three or four, the metasternum one or two, and the metepimerum thirteen to sixteen.

Abdomen.—The abdominal tergites I and II in the ♂ and I—VII in the ♀

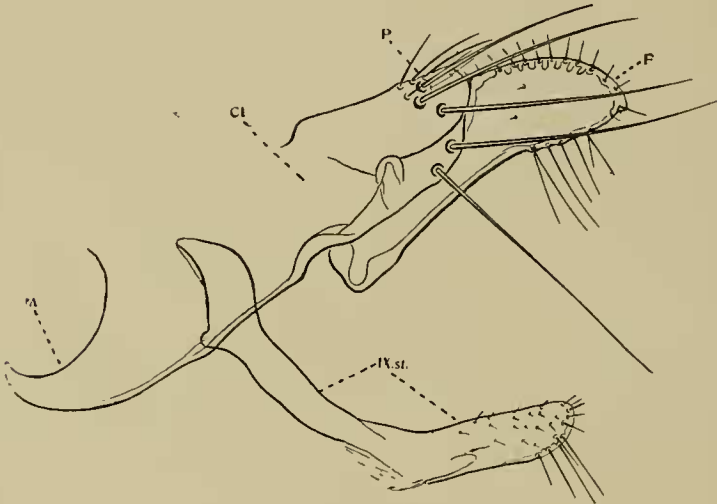


FIG. 17.—*Ctenophthalmus audax*.

have, like the metanotum, two complete rows of bristles, three or four bristles of the posterior row being placed below the stigma, at least on segments II and III, on segment II there is also a bristle of the anterior row placed below the stigma. The sternites of segments III to VI bear in the ♂ on each side a row of four or five bristles, there being rarely a bristle in front of the row, in the ♀ the row contains seven to nine bristles, and there are from four to six bristles in front of the row, the basal sternites bearing in this sex three to six lateral bristles on each side.

Legs.—The mid- and hindcoxae bear posteriorly near the apex one long and one small bristle. The femora have no lateral bristles, except for a small one on the inner surface of the forefemur. There are two subapical ventral bristles on the mid- and hindfemora, and one such bristle on the inner side. This latter bristle is long and thin, particularly on the hindfemur, not being short and stumpy as in European *Ctenophthalmus*. The mid- and hindtibiae have one row of bristles on the outer surface near the dorsal bristles. The first hindtarsal segment bears one or two apical bristles which reach to the apex of the second segment, and two

apical bristles of this latter segment extend to (respectively beyond) the apex of the fourth segment, which segment is only a little longer than it is broad. The fifth hindtarsal segment has three or four lateral bristles, the number differing frequently in the right and left legs, and the true inner edge of the segment (in slide usually anterior) has often only three bristles, when the outer (in slide posterior) bears four. It is the third bristle which varies.

Modified Segments.—♂. The eighth tergite has three small bristles above the stigma, and the sternite a row of five or six long ones, below and proximally to which there are five or six smaller bristles. The process (P) of the clasper (text-fig. 17) is broad and non-sinuate, bearing a number of slender bristles at the upper edge and a transverse, curved, lateral row of five very long ones. The movable process (F) is of the type exhibited by *C. caucasica*. Its ventral edge is gently incurved, not angulate, while the dorsal edge is elbowed opposite the tip of the non-movable process P, being incurved proximally to this angle, and convex

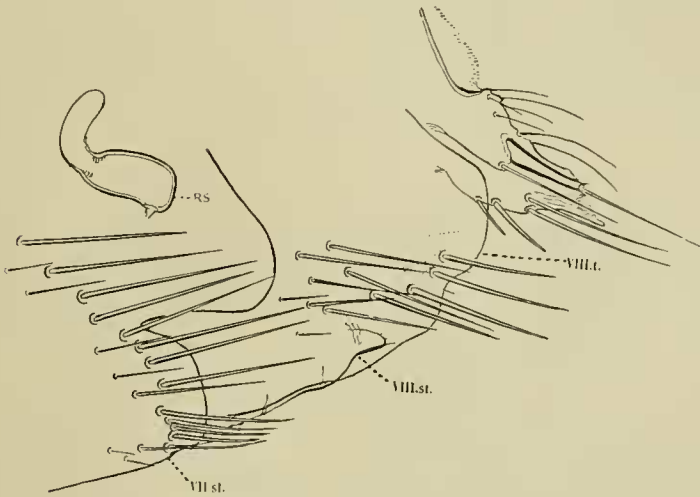


FIG. 18.—*Ctenophthalmus audax*.

between it and the slightly dentiform distal angle. F is provided with ten to thirteen short, pointed bristles along the dorsal edge between the dorsal angle and the tip, and with six long bristles at the ventral edge, there being also some slender bristles ventrally at the tip and a number of other small bristles on both the inner and outer surfaces. These small bristles are particularly numerous on the inner side. The ninth sternite is sub-acuminate, the dorsal edge of the ventral arm being nearly straight and the distal portion of the ventral edge rounded. There is a row of three to five long and slender bristles ventrally near the apex of this sclerite, and about sixteen small bristles distributed over the sides and the edges of its apical half. The anal tergite has on each side about a dozen bristles, the most proximal ones being placed at a short distance from the base of the segment and there being near the apex one longer one on each side. The anal tergite bears only a pair of long bristles on each side.—♀. The seventh sternite has a deep sinus as in *Ct. triodontus*, but the sinus is (text-fig. 18) narrower than in that species. The lobe situated above it is variable in width. The segment bears

on each side a row of twelve to fourteen long bristles, and in front of it eight to fourteen more bristles, some of which are situated close to the row and are also long. The eighth tergite has one to three small bristles above the stigma, a ventral patch of eleven to fourteen, and an internal patch of eight small ones. The eighth sternite (VIII. st.) is somewhat contracted in the specimen from which our figure is taken. The anal sternite bears on each side a moderately long, stout bristle in the middle, sometimes accompanied by a smaller one, and a subapical pair of long ones. The stylet is long and slender, surpassing in length the third hindtarsal segment. Below the stylet there is a solitary long bristle on the anal tergite. The head of the receptaculum seminis (R.S.) is twice as long as it is broad, being also longer than the tail.

The sculpture of the surface of the body and legs is very feeble in both sexes, the lines being hardly traceable on the legs.

Length (mounted specimens): ♂ 3.2 mm., ♀ 3.5 mm.

13 ♂♂ and 20 ♀♀ from Mt. Kinangop, Aberdare Range, Brit. E. Africa, 11,000 ft., February 23, 1910, off *Tachyoryctes audax*;—type.

1 ♀ from Mt. Kinangop, February 24, 1910, off *Otomys irroratus*.

7 ♂♂ from Mt. Kinangop, February 28, 1910, found in killing bottle.

4 ♂♂ and 3 ♀♀ from Aberdare Mts., February 13, 1910, off *Tachyoryctes audax*.

B. Proboscis not nearly reaching to apex of forecoxa; at the most two bristles below stigma on abdominal tergites II and III; longest apical bristle of second hindtarsal segment at most extending to the base of the fourth segment; metepimerum with less than ten bristles.

23. *Ctenophthalmus eumeces* sp. nov. (text-fig. 19).

Only the ♂ known to us.

Head.—The spines of the genal comb are pointed. The rostrum reaches to the apical third (about) of the forecoxa. The frons bears two rows of bristles, and the occiput three rows.

Thorax.—The pronotal comb contains sixteen spines. There are ten bristles in the postmedian row on the three thoracic tergites on the two sides together, the two lower ones being rather further apart than the others. The mesopleura bear eight bristles, the metepisternum two, and the metepimerum five to seven arranged in two rows.

Abdomen.—Each tergite bears two rows of bristles, the first tergite having an incomplete third row. The first bristle of the posterior row is placed below the stigma, while the first bristle of the preceding row is placed above the stigma. The sternites of segments III to VI have on each side a row of three bristles, and in front of it one or two, seldom three, additional smaller bristles, segment VII bearing in the type-specimen four bristles in the postmedian row.

Legs.—The small apical ventral bristle on the inner surface of the hind-femur is short and rather stout. The longest bristle of the second hindtarsal segment reaches a little beyond the apex of the third segment. The fourth segment is not quite twice as long as it is broad in the hindtarsus. The

fifth segment of the same foot bears three plantar bristles on one side and four on the other, or four on both sides.

Modified Segments.—♂. The eighth sternite has four long and from six to nine shorter bristles. The distal process (P, text-fig. 19) of the clasper is broad and obtuse, being slightly notched at the upper margin. It bears a row of six or seven long bristles, slightly variable in position, and at the dorsal margin some smaller ones in addition. The movable process F is longer and slenderer than in any other African species known, and has at the upper edge seven to nine short spiniform bristles, ventrally near the apex two slender bristles and

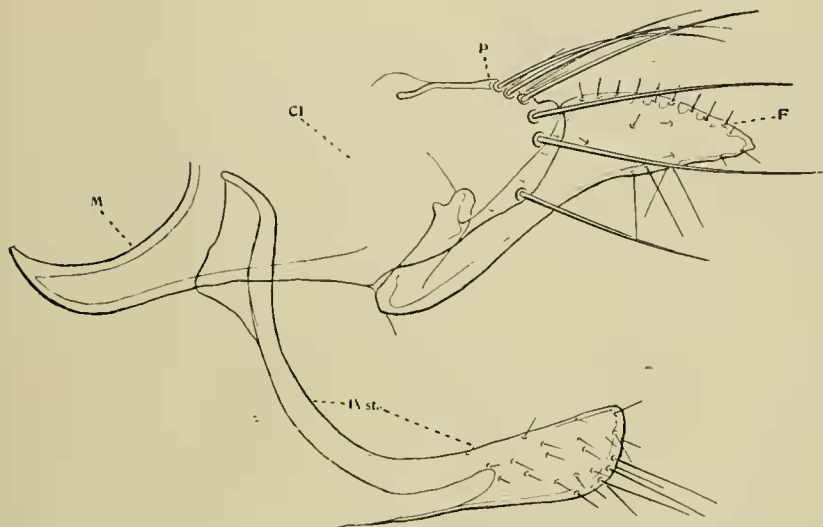


FIG. 19.—*Ctenophthalmus eumeces*.

farther proximally a cluster of four or five, which are much slenderer than in *Ct. audax*. The ninth sternite is almost the same as in *Ct. audax*, except for its slightly larger width.

1 ♂ from Mt. Kenia, British East Africa, December 19, 1910, off *Arvicanthus pumilio*;—type.

1 ♂ from the Igembi Hills, north-east of Mt. Kenia, British East Africa, February 12, 1911, off *Oenomys spec.*

24. *Ctenophthalmus cabirus* spec. nov. (text-figs. 20 and 21).

♂♀. Very close to *Ct. ansorgei* Roths. (1907) and *calceatus* Waterst. (1912), distinctly differing in the modified abdominal segments of the ♂.

The process P of the clasper (Cl, text-fig. 20) is divided into two lobes, as in *calceatus*, the sinus being much deeper and the lobes therefore longer than in *ansorgei*. The upper lobe bears three bristles as in *calceatus*. The movable process F is twice as long as it is broad at the widest point, being shorter but not narrower than in *ansorgei*, and longer than in *calceatus*. The ninth sternite (IX st.) bears a larger number of small bristles than in *ansorgei*.

The ♀ does not present any reliable difference from that sex of *ansorgei*, the specimens being somewhat variable *inter se*. The sinus of the seventh sternite (text-fig. 21, VII. st.) divides the segment into a broad upper lobe and a smaller

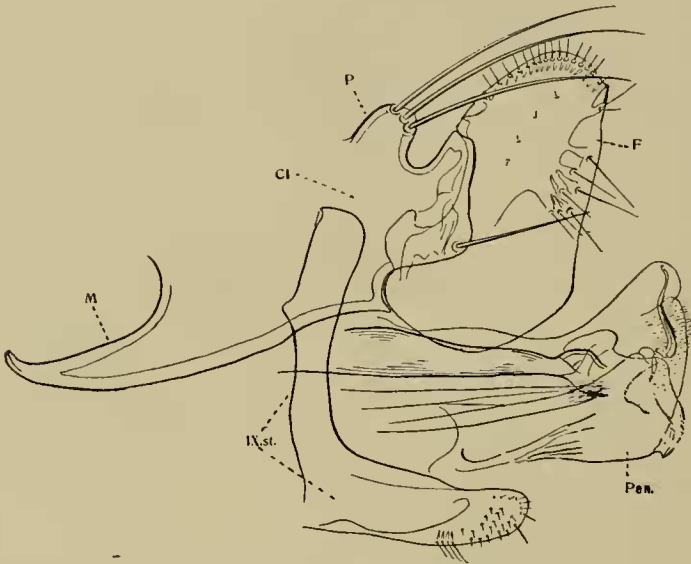


FIG. 20.—*Ctenophthalmus cabirus*.

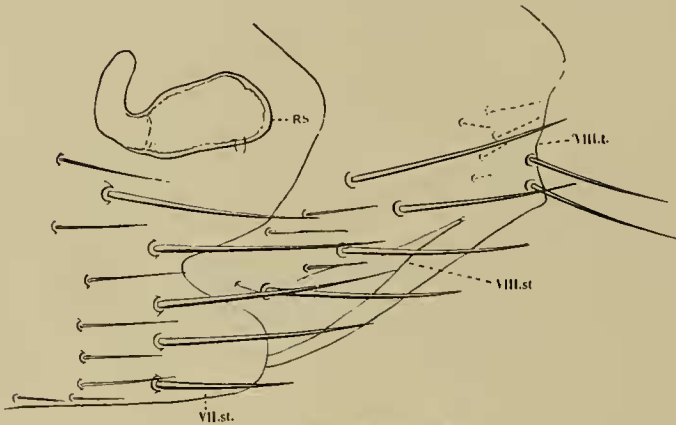


FIG. 21.—*Ctenophthalmus cabirus*.

lower one. The eighth tergite has two bristles at the apical edge above the ventral angle. The head of the receptaculum seminis is longer than the tail.

1 ♂ from Mbarara, Uganda, April 3, 1911, off a rodent.

1 ♀ from Mbarara, July 25, 1911, off *Oenomys* spec.

1 ♂ and 1 ♀ from Rumruti, British East Africa, September 28, 1910, off *Arvicanthus massaicus*.

1 ♀ from Nalasanji, Uganda, July 8, 1911, off *Otomys* spec.

1 ♂ from Nalasanji, Uganda, July 8, 1911, off *Lophuromys ansorgei*.

2 ♀ ♀ from Kigezi, Uganda, April 10 and 27, 1911, off rodents.

4 ♂ ♂ and 4 ♀ ♀ from Kumba, Uganda, June 30, 1911, off *Otomys* spec.;—type.

1 ♀ from Masaka, Uganda, March 22, 1911, off *Arvicanthus abyssinicus rubescens*.

1 ♀ from Nairobi, British East Africa, September 12, 1910, off *Epimys* spec.

1 ♀ from Igembi Hills, British East Africa, February 13, 1911.

1 ♀ from Mt. Kenia, December 7, 1910, off *Lophuromys zena*.

We add the description of a new species collected by Dr. W. J. Ansorge.

25. *Ctenophthalmus atomus* spec. nov. (text-fig. 22).

♀. Differs from *Ct. ansorgei* in the shape of the seventh abdominal sternite. This segment, instead of being divided by a narrow and deep sinus into two lobes, bears one large truncate-emarginate lobe, below which the edge of the segment runs obliquely downward and forward, as shown in fig. 22.

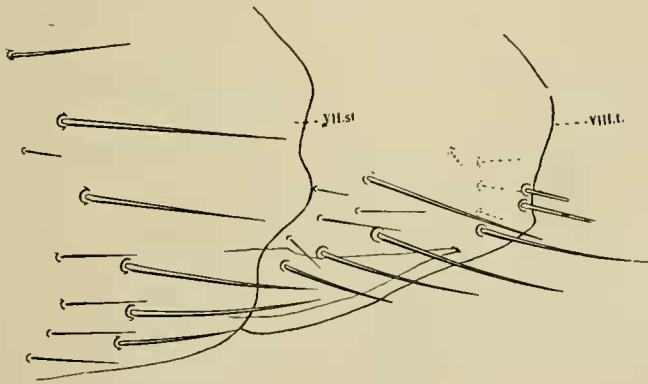


FIG. 22.—*Ctenophthalmus atomus*.

The eighth tergite closely agrees with that of *Ct. ansorgei* and *cabirus*. It bears two apical bristles (both broken in our specimen), as in those species, also a ventral row of four, and above the row one long and four short bristles.

1 ♀ from Ndala Tando, Angola, December 18, 1908, off *Arvicanthus rufinus* (Dr. W. J. Ansorge).

26. *Ctenophthalmus acanthurus* spec. nov. (text-figs. 23 and 24).

♂ ♀. Evidently a near ally of *Ct. engis* Roths. (1907), of which only the ♀ is known. The ♀ of *acanthurus* differs from that of *engis* in the shape of the seventh abdominal sternite and in the longer head of the receptaculum seminis. In the ♀ ♀ of both species the ventral row of bristles on the eighth tergite terminates with a short bristle, which is placed at the apical margin of the segment. The ♂ of *acanthurus* is easily recognised by the ninth sternite bearing a row of short, stout spine-like bristles at the ventral margin.

Head.—The genal spines are pointed. The genal process is nearly twice as broad as the second genal spine.

Thorax.—The mesonotum bears three rows of bristles, besides a basal row which extends down to the second pronotal spine, and a number of additional small bristles on the back and the sides. There is, in fact, only a small lateral area bare of bristles. The mesopleura bear seven, and the metepisternum five or six bristles.

Abdomen.—Segments I to VI have no obvious distinctive characteristics. They bear two rows of bristles on the tergites with an incomplete third row on the first tergite and one or two dorsal bristles in front of the rows on the other tergites. The sternites of segments III to VI have, in the ♂, usually a row of six bristles on the two sides together, and two to six additional bristles, the ♀ bearing, as a rule, eight bristles in the row and four to six in front of it.

Legs.—In the hindtarsus the second segment bears one apical bristle, which reaches to the apex of the third segment; the fourth segment is twice as long as it

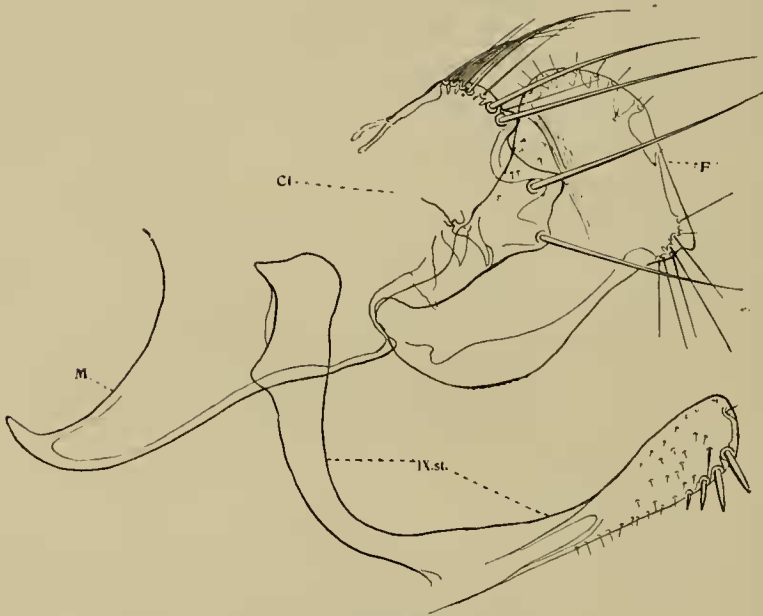


FIG. 23.—*Ctenophthalmus acanthurus*.

is broad, and the fifth segment has four lateral bristles. The proportional lengths of the hindtarsal segments are: ♂. 41, 30, 19, 12, 20; ♀, 42, 31, 20, 12, 20.

Modified Segments.—♂. The eighth sternite is broadly rounded, and bears on each side six to nine bristles, of which three (more rarely only two) are long. The clasper (text-fig. 23) terminates in a broad and short process which is divided by a very shallow apical sinuss into two lobes, the sinuss being deeper on the inner side of the clasper than on the outer surface. The upper lobe is rounded and bears about a dozen bristles at the edge. The ventral angle of this lobe is produced on the inner side of the clasper into a short, subtruncate, strongly chitinised projection. The lower lobe is very obliquely truncate, and bears a long bristle at the ventral angle and another on the outer surface. The movable process (F) has a characteristic shape. Its ventral margin is rounded from the base to three-fourths its length and then incurved, the apical ventral angle of the finger distinctly projecting downward.

Close to this "nose" there are five ventral bristles, and above it two more bristles, one of which is quite short. The dorsal portion of the finger is very strongly rounded-dilated, as shown in the figure, and bears a row of about nine short, spine-like bristles along the most dorsal part of the edge, the distal ones of these bristles being the thinnest. The inner arm of the ninth sternite is rather strongly curved, its apical dilated portion being twice as long as this portion is wide at its centre. The ventral arm is as long as the vertical one, bears numerous small bristles on the sides and at the ventral margin, one small stiff bristle at the apical margin, and a row of four stout, short, strongly chitinised ones at the apical portion of the ventral margin.—♀. The seventh sternite (text-fig. 24) exhibits a row of nine or ten long bristles (on the two sides together), besides some small bristles, and is divided by a deep sinus into a very broad upper lobe and a much narrower rounded lower one. The ventral edge of the upper lobe is excurved near the apex of the sinus, which is rendered very narrow in consequence. The eighth tergite has no bristles above the stigma, and bears a ventral

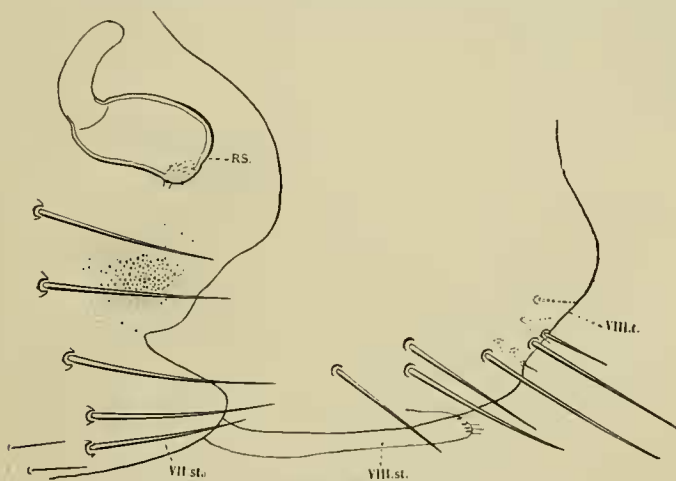


FIG. 24.—*Ctenophthalmus acanthurus*.

row of five or six strong bristles, of which the last is short and placed close to a long one, both being situated practically at the apical edge of the segment. Above this row there is one long bristle, and more proximally than this bristle often one or two small ones. The upper angle of the dilated ventral portion of this segment is sometimes acuminate, sometimes rounded. On the inner surface of the segment are six or seven small bristles. The eighth sternite is broader than usual, its apex being much less narrowed than in the other African species. The stylet is conical, being nearly three times as long as it is broad at the base. The anal sternite bears seven bristles. The head of the receptaculum seminis (R.S.) is longer than the tail.

1 ♂ from Mt. Kinangop, Aberdare Mts., 11,000 ft., British East Africa, February 27, 1910, off *Dendromys insignis*;—type.

1 ♀ from Mt. Kinangop, February 27, 1910, off *Leggada* spec.

3 ♂♂ from Mt. Kinangop, March 1, 1910, off *Crocidura fumosa*.

2 ♂♂ and 6 ♀♀ from Mutaragwa, Aberdare Mts., March 24, 1910, off *Dendromys nigripes*.

- 1 ♂ from Mntaragwa, March 13, 1910, off *Graphiurus microtis saturatus*.
 1 ♂ from Mntaragwa, March 11—14, 1910, off *Thamnomys ibeanus*.
 2 ♂♂ from Mntaragwa, March 13, 1910, off *Epimys jacksoni*.
 1 ♂ from Mt. Kenia, December 1910, off *Lophuromys zena*.

27. *Ctenophthalmus lycosius* spec. nov. (text-figs. 25 and 26).

♂ ♀. A species remarkable for the peculiar shape of the male genitalia. In the number and arrangement of the bristles, apart from the modified segments, this species agrees almost exactly with *Ct. acanthurus*, *engis*, and others. The genal spines are pointed. The genal process in the ♂ is a little broader than the second genal spine, and in the ♀ half as broad again. The lobe of the pronotum situated below the comb is broader than in the allied species, its vertical diameter being equal to the distance from the lower edge of the first spine in the ♂ to the upper edge of the third, and in the ♀ nearly to the centre of the fourth spine. The second hindtarsal segment bears an apical bristle which reaches beyond the third segment, and another which extends to the apex of that segment. The mesopleura of the ♀ bear eight or nine bristles.

Modified Segments.—♂. The eighth abdominal sternite bears on each side

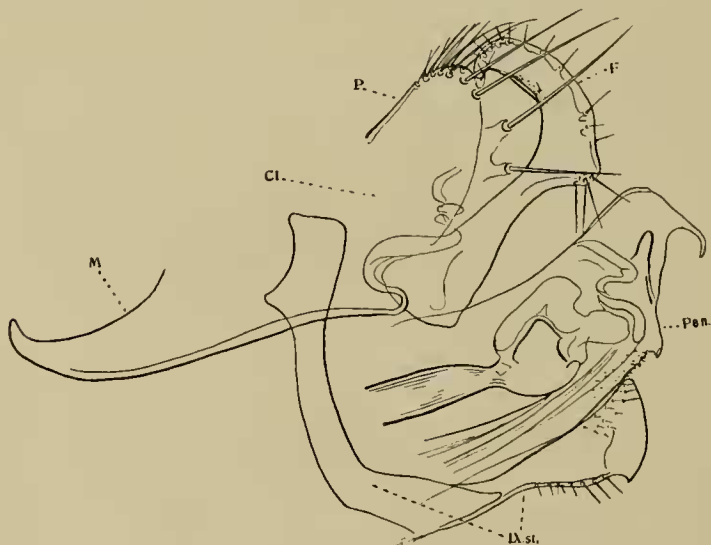


FIG. 25.—*Ctenophthalmus lycosius*.

about nine bristles, of which the three distal ones are the longest. The clasper (Cl, text-fig. 25) terminates in an almost square process (P) which is rounded-truncate distally, the apical margin being divided by a very small sinns into a short upper and a longer lower portion. Above this sinns there are about eight bristles arranged in a double row, the outer row being continued ventrad by three long bristles, of which the last is placed near the ventral margin. The movable process F is distally dilated both dorsally and ventrally, resembling a hammer. There are four long bristles at the truncate ventral angle of F, while the strongly rounded dorsal margin bears a row of spiniform bristles, a few similar bristles, variable in

number and some of them rather long but thin, being placed at the distal (or apical margin). The ninth sternite is very unlike that of every other known African species. Its horizontal arm strongly widens apically, the ventral margin remaining nearly straight to the apex, while the dorsal margin gradually runs upwards, forming an acute, but slightly rounded, angle with the gently convex distal margin. The ventral angle is produced downward into a sharp tooth. The segment has only short bristles, a row of seven or eight being placed at the ventral margin and a patch of about sixteen dorsally near the apex.—♀. The seventh sternite (text-fig. 26) bears on the two sides together in our single specimen an interrupted row of thirteen bristles, and in front of the row twelve additional bristles. The segment is deeply divided by a very large sinuss into a broad upper lobe and a short lower one. The upper lobe is truncate-sinuate, with the upper angle strongly rounded, the ventral angle produced (much as in *Ct. engis*), and the ventral margin horizontal. The lower lobe is much shorter than the upper

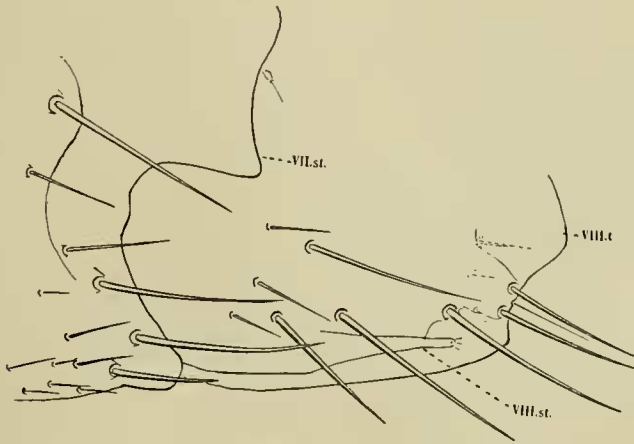


FIG. 26.—*Ctenophthalmus lycosius*.

one, and its upper margin is strongly slanting, being dilated into a very small, obtuse additional lobe near the upper lobe. The eighth tergite has no bristles above the stigma. There is a ventral row of six bristles on this segment (VIII. t.), of which the first is small and the last two, which are long and differ but slightly in size, are placed close together at the apical margin, which is incurved. Above the row there is one long bristle accompanied by two or three smaller ones, while the inner surface bears one or two short but fairly strong bristles and two or three exceedingly small ones. The anal sternite has eight bristles on the two sides together. [The receptaculum seminis has accidentally been destroyed in mounting the specimen.]

2 ♂♂ and 1 ♀ from the Aberdare Mts., British East Africa, February 17—21, 1910, off *Lophuromys zena*.

Another ♀, taken by Mr. Kemp in the same district on February 25 off *Oenomys bacchante* agrees on the whole so well with the ♀ of *lycosius* that we place it here. The mesopleura of this example bear nine or ten bristles, and the seventh abdominal tergite has three antepygial bristles on one side and four on the other; the seventh sternite also being slightly different on the two sides of the body. The

lower angle of the upper lobe of this segment is very little produced and much more broadly rounded off than in the ♀ described above. The lobe of the right side bears an additional small lobe ventrally, which is absent from the lobe on the left side. The ventral lobe is shorter than in the true ♀ of *lycosius*, and the bristles in front of the row on the seventh sternite are more numerous (nineteen on the two sides together). The eighth tergite has above the row one long bristle and three small ones on one side and five small ones on the other, there being five bristles on the inner surface on each side. The anal sternite has ten bristles. The receptaculum seminis resembles that of *Ct. engis* in the head being shorter than the tail, though the head is not quite so short as in *engis*. The specimen possibly represents a distinct species.

28. *Ctenophthalmus cophurus* spec. nov. (text-figs. 27 and 28).

Head.—The first spine of the genal comb is slender and, like the third, sharply pointed, the second spine being the broadest and having an obtuse apex. The genal process is narrower than usual, which is particularly noticeable in the ♀, in which sex the width of the process does not much exceed that of the second genal spine measured in the centre; the upper edge of the process, moreover, is not distinctly elbowed, as it is in the ♀♀ of most other species.

Thorax.—The third spine of the comb is half as long again as the pronotum. The lobe below the comb is narrow, its diameter being equal or inferior to the distance from the lower edge of the second spine to the upper edge of the third measured in the middle. The mesonotum bears two rows of bristles, a few additional dorsal bristles and a series of small basal ones. This latter series only extends as far as the fourth pronotal spine, there being consequently a lateral area on the mesonotum between the basal edge and the two rows of bristles which is devoid of bristles. The mesopleura have seven bristles, the metepisternum has two, and the metepimerium six to nine, usually seven.

Abdomen.—The tergites bear two rows of bristles, the first tergite having a few additional dorsal ones. The first bristle of the second row, and on the second tergite also the first of the anterior row, are placed below the stigma. The basal sternite has no lateral bristles in either sex. The sternites of segments III to VI have in the ♂ a row of six to eight bristles on both sides together, and two to six smaller bristles in front of the row, the numbers being slightly larger in the ♀ and the bristles rather stronger.

Legs.—The apical ventral bristle on the inner side of the hindfemur is short. The longest apical bristle of the second hindtarsal segment reaches a very little beyond the apex of the third segment. The fourth segment of the same tarsus is half as long again as it is broad, and the fifth bears as a rule three lateral plantar bristles on one side and four on the other, the right and left hindtarsi usually differing in these bristles. The proportional lengths of the hindtarsal segments vary slightly, being usually in the ♂ 39, 27, 17, 10, 17, and in the ♀ 44, 28, 18, 10, 18.

Modified Segments.—♂. The eighth sternite (text-fig. 27, VIII. st.) is ventrally produced into a rather narrow lobe which is very feebly chitinated, being vitreous from the most distal bristle and membranous at the apex. The segment bears about a dozen bristles, of which the four to six distal ones are long. The process P of the clasper is broad and rounded, being convex dorsally and somewhat incurved ventrally. It bears a transverse row of usually four long bristles, seldom one or two more, the ventral bristle being accompanied by a smaller bristle and the

row running obliquely distad from the dorsal to the ventral margin. The dorsal edge of the process, moreover, bears several thin and short bristles. The movable

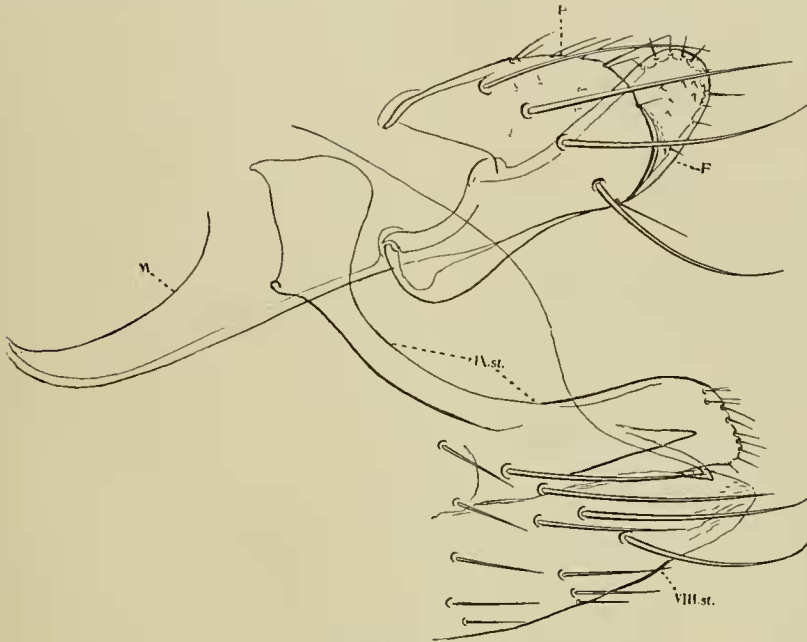


FIG. 27.—*Ctenophthalmus cophurus*.

process F somewhat resembles the sole of a boot. It is narrowest proximally to the centre and has the apex rounded, the ventral edge being more strongly curved than

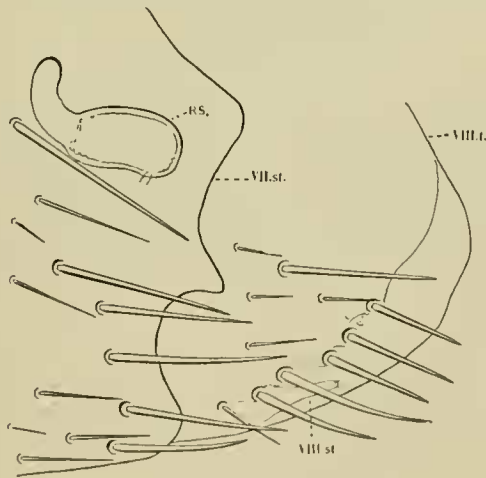


FIG. 28.—*Ctenophthalmus cophurus*.

the dorsal edge. The finger has no long bristles, but only short ones, as shown in the figure. The ninth sternite (IX. st.) is also characteristic in shape. The apex of

the internal vertical arm is very broad, the arm itself slender, and the horizontal arm again broad. This latter portion of the boomerang-shaped segment is not acuminate, as in the allied species, but truncate, with the upper angle rounded and the lower angle about 85° . The apex is but feebly chitinated, and bears a row of short slender bristles (about a dozen), there being no bristles farther proximally on the sides and along the ventral margin. The segment, moreover, is clothed at the almost membranous apex with exceedingly minute hairs not indicated in the figure. —♀. The seventh sternite (text-fig. 28) has a very broad sinuate upper lobe, the lower angle of which is produced into a narrow process of variable length. The segment bears a row of from five to seven long and strong bristles on each side and six to eight additional bristles in front of the row. The eighth tergite is strongly rounded, and is further characterised by the position of the bristles, none of which are placed at the apical edge. There is a subventral row of five or six bristles on this segment, which are all stout, sometimes with the exception of the first; above this row there is one long and thick bristle and two to four smaller ones. On the inside the segment bears one or two minute bristles. The stylet is three times as long as it is broad at the base. The anal sternite has seven or eight bristles on the two sides together. The head of the receptaculum seminis (R.S.) is somewhat longer than the tail.

Length (mounted specimens): ♂ 2.3 mm., ♀ 2.4—3 mm.

1 ♂ and 3 ♀ ♀ from Igembi Hills, British East Africa, February 15 and 16, 1911, off *Lophuromys zena*.

1 ♂ and 9 ♀ ♀ from Aberdare Mts., British East Africa, February 17–21, 1910, off *Lophuromys zena*:—type.

1 ♂ from Mt. Kinangop, Aberdare Mts., February 27, 1910, off *Dendromys insignis*.

1 ♀ from Mt. Kinangop, February 25, 1910, off *Oenomys bacchante*.

1 ♂ from Mutaragwa, Aberdare Mts., March 13, 1910, off *Graphiurus microtis saturatus*.

1 ♂ and 4 ♀ ♀ from Mutaragwa, March 13, 1910, off *Epimys jacksoni*.

4 ♂ ♂ and 3 ♀ ♀ from Mutaragwa, Aberdare Mts., March 1–14, 1910, off *Lophuromys zena*.

1 ♀ from Mt. Kenia, December 7, 1910, off *Otomys irroratus elgonis*.

3 ♂ ♂ from Mt. Kenia, December 8, 1910, off *Lophuromys zena*.

1 ♀ from Mt. Kenia, December 10, 1910, off *Epimys jacksoni*.

1 ♀ from Mt. Kenia, January 3, 1911, off *Epimys jacksoni*.

2 ♂ ♂ and 3 ♀ ♀ from Mt. Kenia, January 3, 1911, off *Thomomys spec.*

1 ♀ from Mt. Kenia, December 12, 1911, off *Epimys medicatus*.

1 ♀ from Mt. Kenia, off *Lophuromys zena*.

29. *Ctenophthalmus eximius* spec. nov. (text-figs. 29 and 30).

♂ ♀. Allied to *Ct. cophurus*, but at once distinguished from it by the fifth hindtarsal segment bearing only three pairs of lateral bristles (besides an anterior ventral pair), by the ♀ having four antepygial bristles instead of three, and by the modified abdominal segments being different.

Head.—The spines of the genal comb are all three sharply pointed. The genal process is broader than in *Ct. cophurus*, being half as broad again as the second genal spine in the ♂, and nearly twice as broad as that spine in the ♀.

Thorax.—The mesonotum has a large lateral area bare of bristles, as in *Ct. cophurus*. The proportional lengths of the hindtarsal segments are as follows : ♂ 40, 26, 18, 9, 17 ; ♀ 43, 29, 19, 9, 17.

Abdomen.—The ♂ bears three and the ♀ four antepygidial bristles, of which the second from above is the longest. The bristles on the sternites of segments III to VII are as follows (on the two sides together, the first figure referring to the bristles of the postmedian row)—♂ : 6 + 3 or 4, 6 + 3 to 5, 6 + 2 to 4, 6 + 2 to 4, 6 + 2 to 4 ; ♀ : 8 or 9 + 11 or 12, 8 + 7 or 8, 8 + 4, 8 + 4, 11 or 12 + 8 or 9.

Modified Segments.—♂. The eighth sternite (text-fig. 29, VIII. st.) is more strongly chitinised apically than in *Ct. cophurus*, and its dorsal margin starts more gradually, moreover being denticulate. The segment bears thirteen to sixteen bristles on the two sides together. The manubrium as well as the non-movable process of the clasper are much shorter than in *Ct. cophurus*, particularly the former. This process (P) is truncate, with the dorsal angle rounded, the lower angle about 90° and the distal margin slightly notched. It bears five slender bristles at the upper

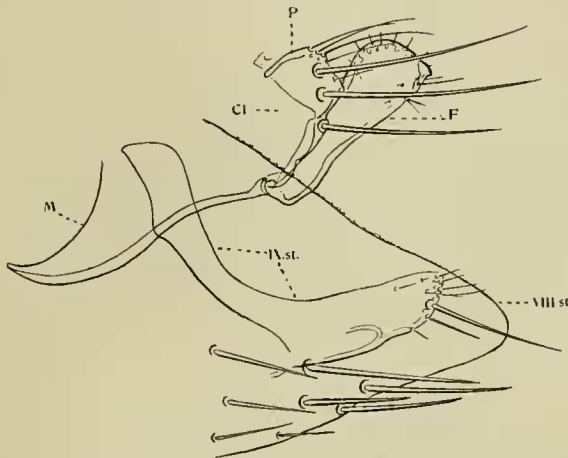


FIG. 29.—*Ctenophthalmus eximius*.

half of the apical margin and an oblique row of three very strong and long bristles on the side, the ventral one being the most proximal. The movable process F is truncate. It almost gradually widens from the insertion to the apex, the ventral angle being distinct and projecting in the shape of a rounded tooth, and the dorsal angle being rounded off. The ventral margin of this exopodite is nearly straight and bears two pairs of small thin bristles in the apical half. The short bristles placed along the apical and dorsal margins, of which there are about eight, are very thin. The inner arm of the ninth sternite is broader than in *Ct. cophurus*, with the exception of the widened apical portion, which is narrower than in that species. The horizontal arm is canoe-shaped distally, being acuminate with the dorsal margin straight and the ventral margin distally rounded. This ventral arm bears about eight small bristles, one long and strong one and behind this bristle a second one half the size (or less) of the long bristle.—♀. The seventh sternite (text-fig. 30) is divided (on each side) by a broad and shallow upper sinus and a smaller, but equally shallow lower sinus into three short lobes, of which the upper one is either pointed or rounded, the second subtriangular with the apex rounded off, and the ventral lobe

quite short. The eighth tergite resembles that of *Ct. cophurus*. It bears a subventral row of five or six stout bristles, sometimes preceded by a small bristle, and above the row there is one long bristle accompanied by one or two small ones. None of the bristles are placed at the apical margin of the segment. On the inner surface the

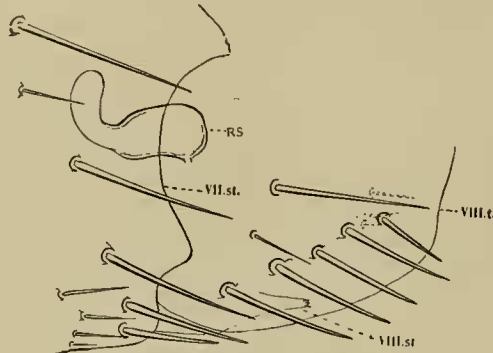


FIG. 30.—*Ctenophthalmus eximius*.

segment bears three to five small bristles. The receptaculum seminis is similar to that of *Ct. cophurus*, but somewhat slenderer than in most examples of that species.

1 ♂ and 1 ♀ from Kigezi, Uganda, April 19, 1911, off *Lophuromys zena*;—type.

1 ♂ and 1 ♀ from Kigezi, April 15, 1911, off *Lophuromys* spec.

1 ♂ from Lake Mutanda, Uganda, May 9, 1911, off *Lophuromys* spec.

2 ♂♂ and 1 ♀ from Nalasanji, Uganda, July 6, 1911, off *Lophuromys* spec.

1 ♂ and 1 ♀ from Chaya, near Ruchuru R., Belgian Congo, September 17, 1911, off *Lophuromys* spec.

2 ♀♀ from Muhamba, Lake Kivu, Belgian Congo, May 20, 1911, off *Lophuromys* spec.

Key to the species of *Ctenophthalmus* known from Africa south of the Sahara.

I. Rostrum reaching to near apex of forecoxa; longest bristle of second hindtarsal segment extending beyond apex of fourth segment; abdominal tergites II. and III. with more than two bristles below the stigma; metepimerum with more than ten bristles; sculpture of surface of body and limbs very inconspicuous.

a. ♂. Movable process of clasper abruptly widened distally, the ventral angle pointing ventrad; ♀ without lateral bristles on the basal abdominal sternite *Ct. triodontus* Roths. (1907).

♂. Movable process of clasper not curved down at apex; the ventral angle pointing distad; ♀ with lateral bristles on the basal abdominal sternite

Ct. audax spec. nov.

II. Rostrum hardly extending to apical third of forecoxa; longest bristle of second hindtarsal segment at the most reaching to base of fourth segment; abdominal tergites with only one bristle below stigma; metepimerum with less than nine bristles; metepisternum narrow; surface-sculpture distinct.

b. Fifth hindtarsal segment with four lateral plantar bristles, at least on one side of the segment or in one hindtarsus c.

This segment with three lateral plantar bristles. Eighth abdominal segment of ♂ triangular; ♀ with four antepygial bristles. *Ct. eximius* spec. nov.

- c. Mesonotum laterally with only two rows of bristles, there being a large naked area between these rows and the base. IX. st. of ♂ truncate, and VIII. st. apically membranaceous; in ♀ all bristles of VIII. t. at a distance from the edge *Ct. cophurus* spec. nov.
- Mesonotum with three rows of bristles and additional small bristles on the sides as well as back, besides the basal row. In ♂ IX. st. acuminate or apically strongly widened; in ♀ the most distal bristle of VIII. st. placed at the apical edge *d.*
- d. ♂♂. *e.*
 ♀♀. *i.*
- e. ♂♂. (This sex not known of *Ct. atomus* and *engis*.)
 IX. st. apically very strongly dilated, the ventral angle being produced into a sharp tooth *Ct. lycosius* spec. nov.
 [and ? *Ct. engis* Roths. (1907)]
- IX. st. subrotundate at apex, bearing a ventral row of short, stout, strongly chitinated spiniform bristles *Ct. acanthurus* spec. nov.
- IX. st. subacuminate or subtruncate, with long and small bristles, or only with short ones, all slender *f.*
- f. Process of clasper divided by a distinct sinns into two lobes *g.*
 Process of clasper not divided *Ct. eumeces* spec. nov.
- g. Sinns of process of clasper quite shallow on outer side, movable process more than twice as long as it is broad *Ct. ansorgei* Roths. (1907)
 The sinns deeper, movable process twice as long as it is broad. *h.*
- h. Apex of movable process much more rounded dorsally than ventrally
 *Ct. cabirus* spec. nov.
- Apex of movable process almost symmetrically rounded
 *Ct. calceatus* Waterst. (1910)
- i. ♀♀. (This sex not known of *Ct. eumeces*.)
 Head of receptaculum seminis shorter than tail. *j.*
 Head of receptaculum seminis longer than tail. *k.*
- j. Last bristle of ventral row on VIII. t. half the length of the preceding bristle
 *Ct. engis* Roths. (1907)
- Last two bristles of that row almost equal in size *Ct. lycosius* spec. nov.
- k. No bristles above stigma of VIII. t. *Ct. acanthurus* spec. nov.
 One or more bristles above stigma of VIII. t. *l.*
- l. VII. st. with a narrow and deep sinus
 *Ct. ansorgei* Roths. (1907) and *cabirus* spec. nov.
- VII. st. with a triangular sinus *Ct. calceatus* Waterst. (1912)
- VII. st. with a very broad upper lobe, lower lobe effaced
 *Ct. atomus* spec. nov.

Dinopsyllus gen. nov.

The antennal groove extends to the vertex, as in *Palaeopsylla* Wagn. (1902), to which genus the new one is closely allied. The frontal tubercle is vestigial, being small and rounded, and having in some specimens the appearance of a transparent lid placed on a tunnel; in most examples the tubercle is exceedingly indistinct (text-figs. 33 and 40). There is a vertical row of five spines along the antennal groove, but in one species (*D. ingens*) this comb is reduced to one or two spines, or is absent. The vestigial eye is placed above the row, and

simulates a sixth spine. The genal process is broad and obtuse, and is separated from the oral edge by a deep sinus, which is partly covered by the first and second spines of the genal comb. The antenna is inserted near the vertex in both sexes. Its first segment is very large, being as long as the club and bearing numerous short bristles. The second segment is very short, except on the anterior side, where it is much produced distad. The first segment of the maxillary palpus is longer than, or as long as, the second, and this is about as long as the fourth, or longer, the third being the shortest. The labial palpus consists of five segments.

The pronotum is long and bears two or three rows of bristles, besides a comb of more than twenty-five spines. The thoracic and abdominal tergites are denticulate at the apical margins, particularly the proximal abdominal segments. The metanotum has no comb of spines, while the following four or five abdominal segments (usually with the exception of the first) bear a lateral comb of short, stout spines. The basal abdominal sternite has always a number of small bristles on the sides, the small bristles in front of the postmedian row of long ones of the other sternites are numerous, and the median tergites have at least three rows of bristles. There are three long antepygidial bristles in both sexes, and the eighth tergite has on each side at least eight bristles above the stigma.

The tibiae bear numerous bristles on the outer surface. The outer dorsal bristles form a comb, as in *Leptopsylla*, *Hystriopsylla*, etc., while four or five inner dorsal bristles are prolonged. The first midtarsal segment is much longer than the second. The fifth segment of the tarsi bears four pairs of lateral ventral bristles (in *ingens* five pairs!), besides an additional pair on the ventral surface near the base.

The modified abdominal segments are very similar in all the species.—In the ♂ the eighth tergite is small and the sternite very large. The ninth tergite is laterally strongly chitinised, a trapeziform plate being formed which bears a row of bristles at the apical margin and two exopodites at the lower distal angle. The upper exopodite (F¹ in our figures) is very long, and reminds one of a sail of a windmill. It is provided with very thin bristles and bears a short, stout, blunt spine at the lower distal corner on the inside. The second process (F² in our figures) is quite short. The horizontal arm of the ninth sternite (one on each side) is more or less dilated at the apex and studded along the ventral margin with moderately thick bristles, of which the distal ones are always short and sharply pointed. The anal segment is long, and there is, proximally to the anal sternite, always a very distinct plate, of which the true homology is still obscure (this sclerite is found in many Siphonaptera).—In the ♀ the seventh sternite has a broad and very shallow apical sinus in all the species, varying but little. The eighth sternite is narrow, long, blade-like, with the tip obtuse. The anal segment, especially the sternite, is long, and bears numerous bristles. The stylet is slender, conical. There is one receptaculum seminis, of which the head is about as long as the tail.

Genotype: *D. ellobius* Roths. (1904, as *Ctenopsyllus*).

Dinopsyllus ingens is a specialised branch which stands apart from the other species of the genus. But, as we may expect intermediate forms to be discovered, it is not advisable at present to place *ingens* in a separate genus.

Dinopsyllus is confined to Africa south of the Sahara, and contains only large species. It is easily distinguished from *Palaeopsylla* Wagn. (1902) and *Leptopsylla* Roths. (1911) by the hairiness of the body, the long first segment of the

antenna, the long pronotum, etc. The species of *Dinopsyllus* differ from *Palaeopsylla* also in some characters which they have in common with *Leptopsylla*—viz. the comb-like dorsal bristles of the tibiae and the long first segment of the midtarsus—and, on the other hand, are distinguished from *Leptopsylla* by the non-angulate frons and the absence of spine-like frontal bristles, besides the previously mentioned differences. The species of *Dinopsyllus* are at first sight very uniform in structure, particularly in the modified abdominal segments, and some of them exhibit obvious differences only in the males: at any rate, we have not been successful in finding the differences in the females of two of the species. The study of *Dinopsyllus*, therefore, presents some difficulties.

Besides the genotype, *D. ellobius*, two other species belonging here have been previously described by the junior author as *Typhlopsylla ingens* and *Ctenopsyllus hirsutus*. The description of *ellobius* was based on a single pair and that of *hirsutus* on one female, all in but moderate state of preservation. As we now have a number of species with which we can compare *ellobius* and *hirsutus*, it appears desirable to point out the main characteristics in which each known species differs from its congeners. For that reason we propose to enumerate here all the species of *Dinopsyllus* with which we are acquainted, whether they were obtained by Mr. Kemp or some other collector. The genus is evidently one of the chief features of the Ethiopian fauna of Siphonaptera.

The collection made by Mr. Kemp contains no less than eight species, all being new to science.

30. *Dinopsyllus echinus* spec. nov. (text-figs. 31 and 32).

♂ ♀. The largest species found by Mr. Kemp. It is at once recognised by the peculiar structure of the derm. The raised lines of the exoskeleton form a network of rather small and in many places almost regular meshes, generally hexagonal. On the sides, however, the transverse connections are so thin that the reticulation appears to be replaced by dorso-ventral lines only connected irregularly. These lines have the appearance of being densely though minutely denticulated, which is not the case in any other species known to us. The denticulation is quite distinct even in unmounted specimens. The teeth are the proximal portions of the transverse lines, of which the distal portions are not visible in transmitted light. The species greatly resembles in size and general appearance *D. hirsutus* Roths. (1908).

Head.—The frons is evenly rounded in the ♂ and inclines very little backwards, being broad ventrally, the distance of the frontal oral corner to the tip of the lowest genal spine being larger than the distance from that corner to the vestigial frontal tubercle. The latter is situated below the centre of the frons. The genal process measured from the tip of the second genal spine is as long as this spine measured from the tip of the third spine. The bristles of the head are essentially the same as in other species of this genus. The maxillary palpus is characterised by the second segment being longer than usual, the measurements, which vary to a slight extent, being: ♂ 24, 22, 15, 19; ♀ 25, 25, 15, 22.

Thorax.—The pronotum has a comb of thirty-five to thirty-eight spines and three rows of bristles, of which the anterior row is incomplete. The mesonotum bears dorsally seven to eight rows of bristles, and has, as in other species, a couple of setiform spines near the apex internally on both sides. The metanotum bears only five rows of bristles. The metepimerum has from thirty-five to fifty bristles.

Abdomen.—The basal abdominal sternite has seven bristles in the ♂ and from

twenty-three to thirty-five in the ♀. The central segments bear dorsally five rows of bristles. Most specimens are provided with four combs of spines on segments II-V, the ♂♂ sometimes (*e.g.* in the type-specimen) bearing a spine at the apex of the segment I. The numbers of spines in the combs are as follows: II 7-9, III 8-12, IV 8-13, V 0-4.

Legs.—These agree with the legs of the other species of the genus.

Modified Segments.—♂. The ventral angle of the eighth sternite (text-fig. 31) is

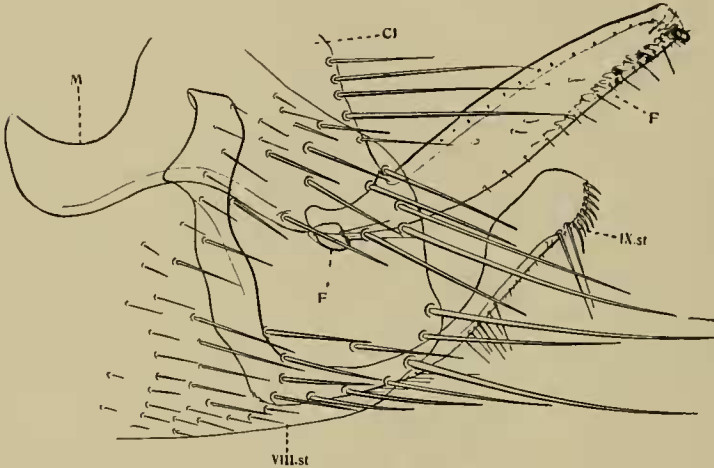


FIG. 31.—*Dinopsyllus echinus*.

rounded off and bears two bristles, the interspace between which either nearly equals, or is almost twice as wide as, the groove of the upper bristle, which is the larger

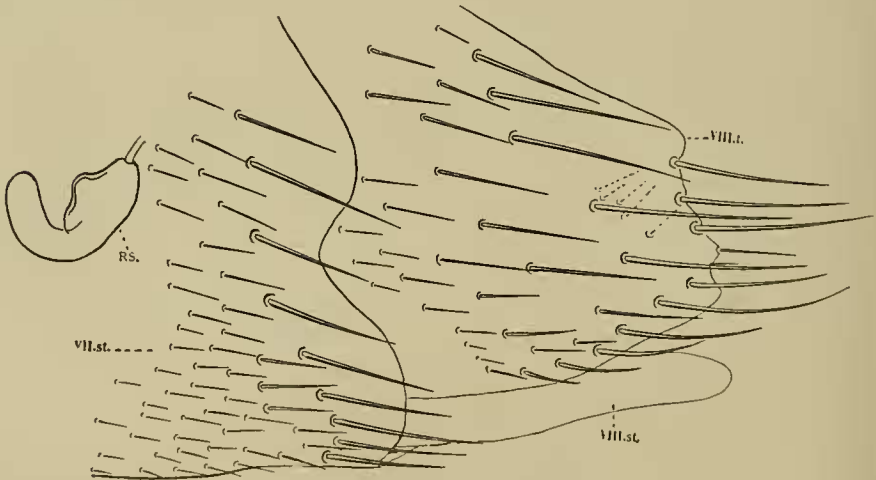


FIG. 32.—*Dinopsyllus echinus*.

of the pair. The long process of the elasper is slightly more convex on the upper side than on the lower, and is widest proximally to the centre. Its upper margin

is three and a half times as long as the largest transverse diameter of this process. The ninth sternite bears three sets of bristles on the ventral side, an apical row of nine or ten, of which the last two are long, a median row of seven or eight, and a number of thin bristles situated along the proximal half of the segment. The dilated apex of the ninth sternite is dorsally flattened.—♀. The seventh sternite (text-fig. 32) is rather deeply sinuate. The distance of the long subapical bristles of this sternite from the bottom of the sinus equals at the most the distance between four bristles of the last row of the seventh tergite. The eighth tergite nearly always bears four bristles above the apical sinus and, as in the other species, a thin one in the sinus, one example having three instead of four bristles.

Length (mounted specimens): ♂ 4.5 mm., ♀ 4.5 to 5.7 mm.

1 ♂ and 2 ♀ ♀ from Mutaragwa, March 7, 1910, off *Epimys jacksoni*.

1 ♂ from Mt. Kenia, December 5, 1910, off *Lophuromys zena*.

1 ♂ and 1 ♀ from Igembi Hills, N.E. of Mt. Kenia, British East Africa, February 15, 1911, off *Epimys* spec.

2 ♂ ♂ and 3 ♀ ♀ from Mutaragwa, Aberdare Mts., Brit. E. Africa, March 1–14, 1911, off *Lophuromys zena*.

2 ♀ ♀ from Muhamba, Lake Kivu, March 20, 1911, off *Lophuromys zena*.

1 ♀ from Kidaha, Mutanda, Uganda, off *Lophuromys* spec.

1 ♀ from Kigezi, Uganda, April 12, 1911, off *Arvicanthus abyssinicus rubescens*.

31. *Dinopsyllus hirsutus* Roths. (1908).

Ctenopsyllus hirsutus Rothschild, *Ent. Mo. Mag.* (2) xix. p. 78. no. 4. tab. 1. fig. 4 (1908) (Ruwenzori).

Described from a single ♀ obtained on *Mus univittatus lunaris*. This specimen agrees closely with the females of the preceding species, but the differences are such that they would not justify us in treating *hirsutus* and *echinus* as being the same insect.

♀. *D. hirsutus* shares with *D. echinus* the dense reticulation of the body, the long second segment of the maxillary palpus, the shape of the outline of the head, and the size, but is distinguished by the following characters. The denticulate appearance of the sides of the abdomen is absent from *D. hirsutus*, the metepimerum bears only 27 (24)* bristles, and the combs of the abdomen contain very few spines, the numbers being 5, 3, 2, 0 (4, 3, 2, 0). Moreover, the seventh tergite is abruptly dilated below the antepygidial bristles into an almost rectangular lobe, the corresponding lobe of *D. echinus* being much more rounded and projecting much less. The distance of the long bristle nearest to the base of the sinus of the seventh sternite is much larger than in *D. echinus*, equalling the distance between six bristles of the subapical row of the seventh tergite. The eighth tergite bears three bristles at the apical margin above the sinus, the upper bristle being much stouter and shorter than the second. The basal abdominal sternite bears 16 (17) bristles on the side in *D. hirsutus*, and 22 to 35 in the ♀ of *D. echinus*.

Mr. Kemp did not meet with this species.

In the species now following the surface of the body does not bear a distinct reticulation except in a few restricted places—e.g. on the abdominal sternites in between the bristles—whereas the vertical lines are very obvious. There are few transverse connections between these lines. The difference between the preceding

* The numbers in brackets refer to the other side of the body.

species and the following ones is even more pronounced in reflected light than in transparent light, the whole body of *D. echinus* and *hirsutus* having the appearance of being densely covered with an armour of small scales, while in the following species only the dorso-ventral lines are visible.

An imitation of small teeth occurs in all the following species in the apical area of the abdominal sternites, and is observed, as may incidentally be mentioned, in many other Siphonaptera, e.g. *Leptopsylla*.

32. *Dinopsyllus longifrons* spec. nov. (text-figs. 33 and 34).

♂ ♀. On an average larger than the following species, but smaller than the previous ones. The frons is longer in the ♂ than in any other known species, with the exception of the one from Angola described as No. 39 of this paper. The pronotum, as a rule, has three rows of bristles in both sexes, the abdominal bristles are very numerous, in the ♀ particularly on the basal sternite and eighth tergite, and the ♂ has usually a comb on the first abdominal tergite.

Head.—The frons, in the ♂, is very strongly curved (text-fig. 33) in the region of the frontal tubercle and almost straight farther down, the outline being nearly

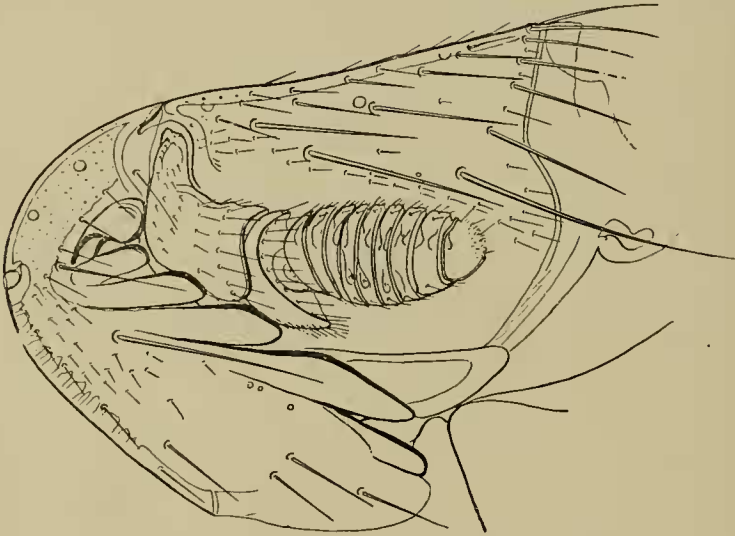


FIG. 33.—*Dinopsyllus longifrons*.

parallel with the row of genal spines. The vestigial frontal tubercle is situated at two-thirds in the ♂ and in the centre or a little below it in the ♀. The distance of the tip of the first genal spine from the frontal oral corner is less than half the length of the frons. There is a row of five or six bristles above the vestigial eye, one longer bristle immediately below this row, and a long one farther down at some distance in front of the third genal spine (counted from below). Numerous small bristles varying in number are placed on the frons from the vestigial frontal tubercle downwards, besides five or six medium-sized ones, which are situated at and near the frontal and genal edges. The occiput bears three rows of bristles, the last row containing fifteen or sixteen on the two sides together. The proportional lengths of the segments of the maxillary palpus are 21-22, 15-17, 11-12, 16-17. The head of the ♀ agrees with that of the ♂, except in the frons being much shorter, more

evenly rounded and broader. The short bristles found above the antennal groove and on the first segment of the antenna are more numerous in the ♀ than in the ♂, the ♀-antenna, in addition, being much shorter.

Thorax.—The pronotum has a comb of 27–29 spines in the ♂ and 29–31 in the ♀, and bears in most specimens three rows of bristles, containing in the ♂ 9–11, 16–19 and 14 bristles respectively, the numbers being in the ♀ 0–3, 18–19, 13–14. The mesonotum has seven rows of bristles, the anterior rows being irregular and incomplete; the metanotum has six rows, of which the first is represented by a few bristles only. The mesopleura bear in the ♂ 27–30 bristles and in the ♀ 34–50, the metepimerum having at least twenty-nine in both sexes.

Abdomen.—In most ♂♂ the first abdominal tergite bears a comb of a few spines, but apparently never in the ♀. The second to fifth tergites have a lateral comb in the ♂ and the second to fourth in the ♀, the sixth of the ♂ and fifth of the ♀ bearing occasionally a single spine. The numbers of spines in the combs on each side are: ♂—I 0–4, II 8–11, III 8–13, IV 11–15, V 6–9, VI 0–1, and in the ♀ I 0, II 4–6, III 5–7, IV 3–7, V 0–1. The tergites I–VII bear each four rows of bristles with a few additional small bristles in front. The bristles of the tergites are more numerous in the ♂ than in the ♀. The basal sternite has ten to fourteen small lateral bristles in the ♂ and seventeen to twenty-three in the ♀, besides a number of bristles placed at the ventral margin. The posterior row on the sternites of segments III–VI contains on the two sides together eight to eleven long bristles in both sexes, there being twenty-five to forty-five bristles in front of the row.

Legs.—The forecoxa has about a hundred bristles on the outer surface and the margins, and the forefemur about ten to fifteen small lateral bristles on the outside in the ♂ and sixteen to twenty-two in the ♀. The mid- and hindfemora have lateral bristles only at and near the apex. The comb-like dorsal bristles of the foretibia number eleven or twelve, while those of the hindtibia vary from fifteen to nineteen. Each tibia bears four long inner dorsal bristles, the corresponding bristle of the first notch on the foretibia also being prolonged. The bristles of the tarsi are short but very numerous. Many of the additional lateral bristles are rather pale, such bristles being particularly numerous on the anterior side of the second hindtarsal segment. The measurements of the tarsi are as follows in two pairs:

Foretarsus :	♂—17, 15, 11, 8, 16 ;	♀—21, 15, 11, 8, 18.
	19, 16, 11, 8, 17 ;	21, 15, 11, 8, 18.
Midtarsus :	♂—29, 20, 12, 9, 20 ;	♀—37, 23, 14, 9, 18.
	35, 25, 15, 10, 20 ;	38, 24, 14, 9, 18.
Hindtarsus :	♂—55, 41, 24, 13, 20 ;	♀—65, 42, 23, 14, 19.
	64, 44, 25, 15, 21 ;	63, 45, 24, 15, 22.

Modified Segments.—♂. The eighth tergite (text-fig. 34) bears about a dozen short bristles above the stigma on each side. The eighth sternite has the apical margin slightly incurved; the lower angle projecting a little, though it is strongly rounded off. The bristles number about fifty-five to sixty, and are divided by a naked apical area into an upper and a lower set, as shown in the figure. The ninth tergite bears a row of hairs below the sensory plate and four large bristles at the apical margin of the lateral incrassate portion which corresponds to the clasper of other Siphonaptera, these long bristles being accompanied by one or two small ones. The long process F^1 is more strongly widened in the centre than in the other known

species of *Dinopsyllus*, and its upper apical angle projects distinctly. The bristles of the ninth sternite, though somewhat variable, exhibit a common plan of arrangement in all the specimens. There is an apical series of seven to nine, of which the two posterior bristles—occasionally separated by a short one—are long. In a proximal direction several minute hairs follow, then a solitary long bristle, and one or more minute hairs, and finally a row of small and moderately long bristles (text-fig. 34).—♀. The seventh sternite has nearly the same outline in all the species, the apical margin bearing a broad and shallow sinus. This sclerite has in *longifrons* a postmedian row of from fifteen to nineteen long bristles on the two sides together, there being from forty-seven to over sixty smaller bristles in front of the row. The eighth tergite bears about fifty bristles below the stigma and about twenty above it, on each side. The apical margin of this tergite is sinuate above the ventral angle, which is pointed, a thin bristle being placed in the sinus and three



FIG. 34.—*Dinopsyllus longifrons*.

larger ones above it. There is an oblique subapical row of four bristles on the inner surface of the eighth tergite. The receptaculum seminis has a hump on the upper side of the head.

Length (mounted specimens) : ♂ 3.5–4 mm. ; ♀ 4.3–5.2 mm.

2 ♂♂ and 1 ♀ from Aberdare Mts., British East Africa, February 13, 1910, off *Tachyoryctes audax* :—type.

1 ♀ from Mt. Kinangop, Aberdare, February 24, 1910, *Otomys irroratus elgonis*.

2 ♀♀ from Rumruti, British East Africa, October 31, 1910, off *Thamnomys* spec.

1 ♂ from Rumruti, British East Africa, October 28, 1910.

1 ♀ from Nakura, British East Africa, September 21, 1910, off *Arvicanthis abyssinicus rubescens*.

1 ♂ from Mt. Kenia, British East Africa, December 18, 1910, off *Epimys* spec.

1 ♂ from Kigezi, Uganda, April 28, 1911, of *Lophuromys* spec.

1 ♀ from Nalasanji, Uganda, July 8, 1911, off *Lophuromys* spec.

- 1 ♀ from Mbarara, Uganda, July 30, 1911, off *Oenomys* spec.
 1 ♂ and 1 ♀ from Mt. Kenia, off *Epimys* spec.
 1 ♀ from Kidnhi, Uganda, off *Lophuromys* spec.
 2 ♀ ♀ from Kigezi, Uganda, April 27, 1911.
 1 ♀ from Kigezi, April 12, 1911, off *Arvicanthus abyssinicus rubescens*.
 1 ♀ from Chaya, Belgian Congo, June 17, 1911, off the same host.

33. *Dinopsyllus apistus* spec. nov. (text-fig. 35).

This species and the next are easily distinguished in the ♂♂, but the ♀♀ do not seem to present any reliable differences, provided that the specimens which we presume to be the females of *apistus* belong to this species and not to the next.

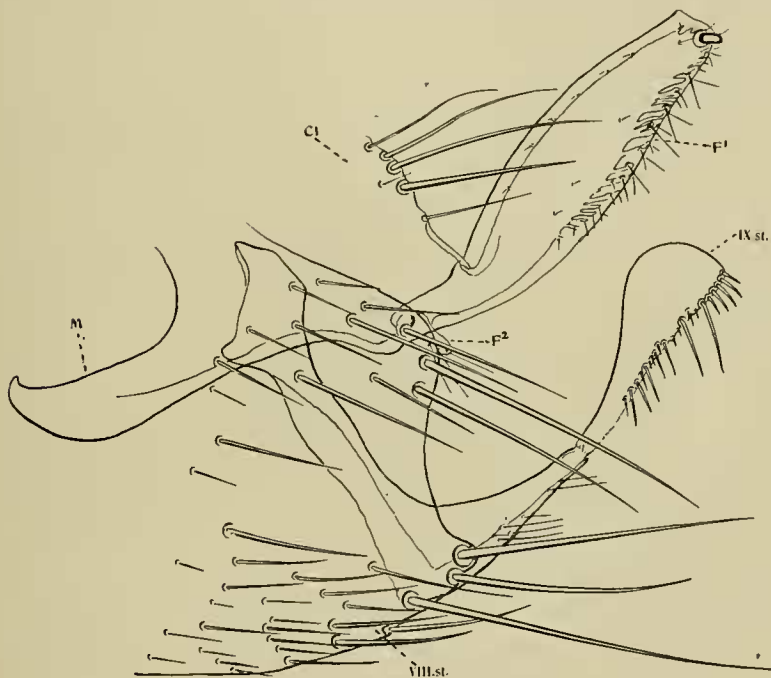


FIG. 35.—*Dinopsyllus apistus*.

D. apistus and all the following species are so closely allied to *D. longifrons* that most of the characters mentioned in the above description of that species apply equally well to these other species. For the sake of brevity we shall therefore endeavour to avoid repetition, and confine the descriptions of the following species as much as possible to the main distinguishing characters. With the exception of the last species (from Angola) the thorax and abdomen bear less bristles than in *D. longifrons*, the spines in the abdominal combs are less numerous, the ♂♂ have no comb on the first abdominal tergite the eighth abdominal tergite of the ♀♀ has less than forty bristles below the stigma, the frons of the ♂♂ is shorter, and their clasping organs exhibit some distinctions in shape and in the number and position of the bristles.

♂. *D. apistus* ♂ is recognised by the apical ventral angle of the eighth

sternite being produced and bearing two long bristles placed close together (text-fig. 35). The process F^1 of the clasper, moreover, is a little less widened in the centre than in *D. longifrons*. The ninth sternite (IX. st.) is strongly rounded dorsally at the apex and very slender in the centre. It bears about six small and slender bristles in the proximal two-fifths, no bristles in the central fifth, and a slightly variable comb of stiff bristles in the apical third, either two (type) or three of the bristles of this comb being as long as the sclerite is broad at the widest point of the dilated apex.

The distances of the oral frontal corner from the tip of the ventral spine of the genal comb on the one hand and from the centre of the vestigial frontal tubercle on the other are 66 and 100 respectively. The mesonotum has six rows of bristles (the anterior rows being irregular) and the metanotum five or six rows. The mesopleura bear sixteen to eighteen bristles, the metepimerum nineteen to twenty-two, the first abdominal sternite five to seven, the seventh sternite (on the two sides together) a row of eight, and seventeen to twenty additional smaller bristles, and the eighth sternite about forty-two bristles. One of the specimens has only one apical spine on each of the abdominal segments II, III, and IV, while other examples have several spines—*e.g.* the type bears on one side 3, 3, 4, 1 spines, and on the other 2, 3, 5, 1.

One of the ♂♂ (see below) is accompanied by two ♀♀; these three specimens, being taken off the same individual of the host, are, presumably, one species. The two ♀♀ agree in most details with one another, but do not present any marked difference from ♀♀ obtained in other localities and on other hosts, and belonging to some other species—*e.g.* *D. lypus*. The number of bristles on some of the segments are as follows: The mesopleura have seventeen or nineteen bristles, the metepimerum twenty-four or twenty-five, the first abdominal sternite fifteen or sixteen, the seventh tergite a row of twelve and twenty small additional bristles on the two sides together in both specimens, the seventh sternite a row of sixteen and forty-six additional bristles, also in both examples, and the eighth tergite twenty-nine or thirty-five bristles below the stigma. There are three abdominal combs, consisting of 3, 4, 4 and 3, 4, 5 spines.

Length (mounted specimens): ♂ 3–3.5 mm.; ♀ 3.5 mm.

1 ♂ and 2 ♀♀ from Mt. Kenia, British East Africa, December 25, 1910.

1 ♂ from Mt. Kenia, British East Africa, December 13, 1910, off *Epinys jacksoni*.

1 ♂ from Mt. Kenia, British East Africa, January 2, 1911, off the same host.

1 ♂ from Kigezi, Uganda, April 28, 1911, off *Lophuromys* spec. :—type.

1 ♂ from Mt. Kenia, British East Africa, January 3, 1911, off *Heliosciurus keniae*.

34. *Dinopsyllus lypus* spec. nov. (text-figs. 36 and 37).

Evidently the commonest species of the genus in British East Africa and Uganda.

♂. The ventral apical angle of the eighth abdominal sternite (text-fig. 36) is strongly rounded off, not being produced as in *D. apistus*, and bears two bristles, the space between which is about twice as wide as the groove of a bristle. Proximally to these bristles there is a very long one, as shown in the figure. The number of bristles on the eighth sternite is sixty odd (on each side). The process F^1 of the clasper is practically the same as in *D. apistus*, but the ninth sternite is characterised by bearing an apical row of eight bristles, of which the posterior three are long, a median row of five to eight, and a few thin proximal bristles.

The type-specimen has twenty-seven bristles on the mesopleura, twenty-five on the metepimerum on one side and twenty-nine on the other, thirteen small ones on

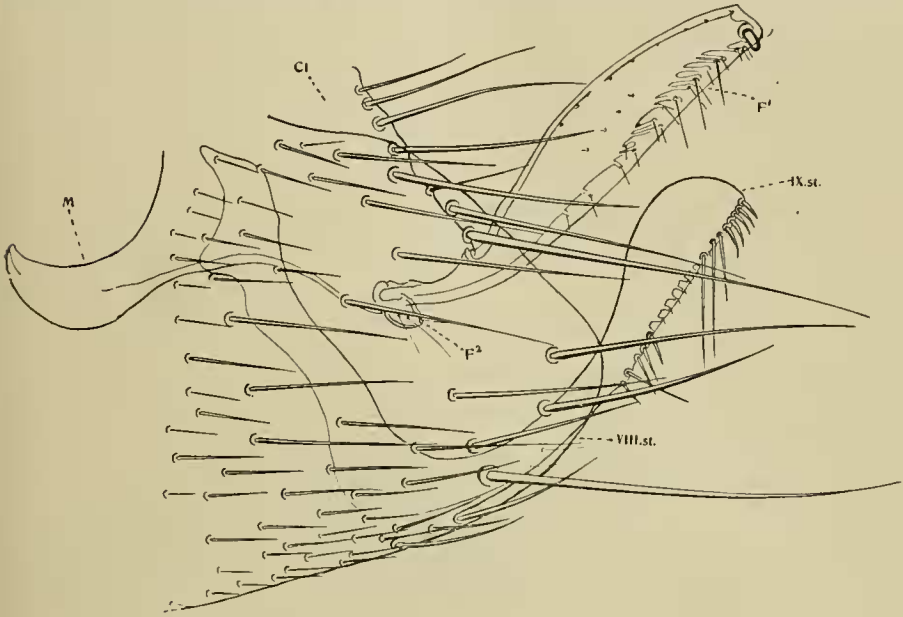


FIG. 36.—*Dinopsyllus lypusus*.

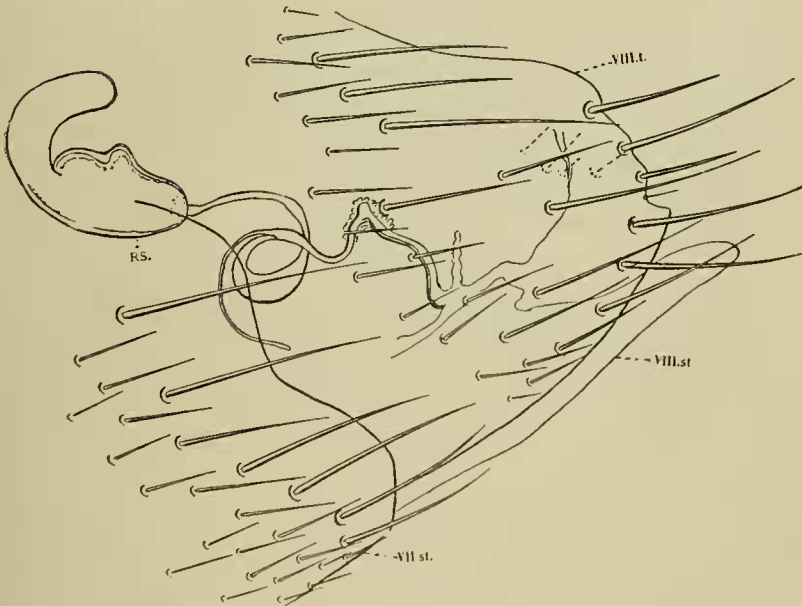


FIG. 37.—*Dinopsyllus lypusus*.

the basal sternite, and four abdominal combs consisting of 4, 5, 7 and 1 spines on one side and 4, 7, 6 and 2 on the other.

Some specimens which we consider as belonging to this species have a vestigial third row of bristles on the pronotum. A series of five ♂♂ (and four ♀♀) taken off *Epimys medicatus* at Nairobi, moreover, proves the bristles on the ninth sternite of the ♂ to be variable in number, particularly the median series. The numbers of teeth in the abdominal combs of these five ♂♂ are as follows (one side only counted): 4, 5, 7, 5—4, 4, 4, 1—3, 5, 5, 0—4, 6, 5, 3—4, 5, 4, 2.

Length (mounted specimens): ♂ 3·3—4 mm.; ♀ 3·4—4·3 mm.

1 ♂ and 2 ♀♀ from Rumruti, British East Africa, October 31, 1910, off *Nasilio delamerei*.

3 ♂♂ from Rumruti, October 26 and November 8, 1910, off *Epimys medicatus*.

2 ♀♀ from Rumruti, October 27 and 28, 1911, off *Arvicanthus massaicus*.

1 ♂ and 2 ♀♀ from Rombo, Kilimanjaro, June 7 and 21, 1910, off *Arvicanthus ardens*.

1 ♀ from Mutaragwa, Aberdare Mts., March 1 and 14, 1910, off *Lophuromys zena*.

2 ♀♀ from Nairobi, British East Africa, September 16, 1910, off *Arvicanthus* spec.

2 ♀♀ from Nairobi, September 12, 1910, off *Otomys* spec.

1 ♀ from Nairobi, September 13, 1910, off *Arvicanthus* spec.

5 ♂♂ and 4 ♀♀ from Nairobi, September 12, 1910, off *Epimys medicatus*.

2 ♀♀ from Nakura, British East Africa, September 20, 1910, off *Epimys* spec.

1 ♀ from Naivasha, British East Africa, September 17, 1910, off *Epimys* spec.

1 ♀ from Igumbi Hills, British East Africa, February 15, 1911, off *Otomys* spec.

2 ♀♀ from Masaka, Uganda, March 27, 1911, off *Arvicanthus abyssinicus rubescens*.

1 ♂ from Masaka, Uganda, July 31, 1911, off *Otomys* spec.

1 ♂ from Kigezi, Uganda, April 2, 1911, off *Arvicanthus abyssinicus rubescens*.

2 ♂♂ and 7 ♀♀ from Mbarara, Uganda, April 3, 1911, off *Oenomys* spec.

1 ♀ from Mbarara, Uganda, July 28, 1911, off *Oenomys* spec.

1 ♀ from Kagambah, Uganda, July 10, 1911, off *Epimys walambae pedester*.

1 ♀ from Kagambah, July 14, 1911, off *Lophuromys* spec.

1 ♀ from Kagambah, July 14, 1911, off *Dasymys medius*.

1 ♂ and 1 ♀ from Nalasanji, Uganda, July 8, 1911, off *Lophuromys ansorgei*.

35. *Dinopsyllus grypurus* spec. nov. (text-fig. 38).

♂. Similar to *D. lypusus*, but abundantly distinct in the clasping organs. The eighth abdominal segment is as in *D. lypusus*. The two bristles which are placed near the ventral apical angle are sometimes close together, occasionally (*e.g.* in the type-specimen) the space between them is about twice as wide as the groove of a bristle. The long process F^1 of the clasper is of nearly even width throughout and, in contradistinction to all the other species, is bent upwards. The apex of the ninth sternite (text-fig. 38) is more rounded ventrally than in the other forms, and the short bristles placed there are straight and thin, at any rate thinner than in the other species. The number of bristles on the ninth sternite is not constant, being different to some extent even on the right and left halves of the sternite. There is an apical set of from five to eight, of which two or only one is long, then follows (proximad) a gap with minute bristles, sometimes interrupted by a single moderately long one (as in fig. 38), and then

a set of three or four, of which one is somewhat prolonged, there being also some additional minute bristles at the ventral edge farther proximally.

The frons is a trifle longer than in *D. lyplusus*. The meso- and metanota bear five rows of bristles, the former having a few additional bristles dorsally near the base. The mesopleura are studded with eighteen bristles, the metepimerum with twenty-one to twenty-four, and the first abdominal sternite with three to nine. The abdominal combs consist of the following spines in the three mounted specimens,

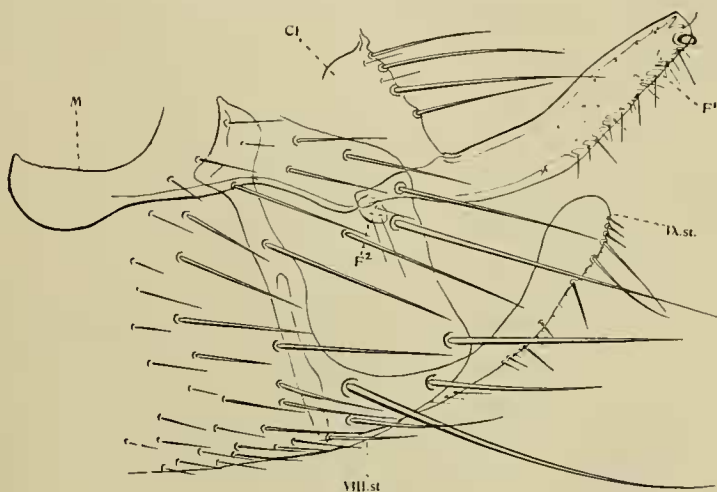


FIG. 38.—*Dinopsyllus gryppurus*.

the figures in brackets referring to the combs of the other side of the same specimen : 3, 2, 4 (2, 6, 5)—4, 4, 4 (4, 4, 4)—3, 4, 6 (5, 3, 4).

Length (mounted specimens) : ♂ 3.0–3.5 mm.

4 ♂♂ from Mntaragwa, Aberdare Mts., British East Africa, March 24, 1910, off *Dendromys nigrifrons*;—type.

1 ♂ from Mt. Kinangop, Aberdare Mts., March 1, 1910, off *Crocidura fumosa*.

36. *Dinopsyllus eremus* spec. nov. (text-fig. 39).

♀. Two females obtained by Mr. Kemp in Belgian Congo and one in British East Africa differ so much in the receptaculum seminis from all other females that we have no doubt of their specific distinctness. In all the females, inclusive of *D. echinus* and *hirsutus*, the receptaculum has a prominent hump on the upper side of the “head,” and apparently does not present any differences in the various species. On the other hand, the receptaculum seminis of *D. eremus* has no hump whatever (text-fig. 39).

The specimen, moreover, is distinguished from *D. lyplusus* and *apistus* by the slightly different position of the vestigial frontal tubercle. In the two species mentioned the tubercle is situated in the ♀, a little nearer to the frontal oral corner than to the hind edge of the frons, while in *D. eremus* the reverse is the case. The occiput measured along the dorsal line is twice as long as the distance of the antennal groove (on the vertex) to the frontal tubercle in *D. eremus*, and only about half as long again as that distance in *D. lyplusus* and *apistus*. The

pronotum is longer than in the species mentioned, particularly the comb, which contains thirty-five spines. The mesopleura bear 20 (19) bristles, the metepimerum has 26 (25), the basal abdominal sternite 13 (13), the seventh tergite on the two sides together a row of nine long bristles, and in front of the row twenty-one additional bristles, the numbers on the seventh sternite being thirteen and forty-eight, and the eighth tergite has on each side six bristles above the stigma and thirty-one to thirty-seven below it. The three combs of the abdomen contain 4, 4, 6 (4, 2, 6) spines. The numbers in brackets refer to the other side. The stylet is half as long again as in *D. apistus* and *lypusus*, being as long as in the much larger *D. hirsutus* and equalling twice the distance between the first and second bristles of the posterior

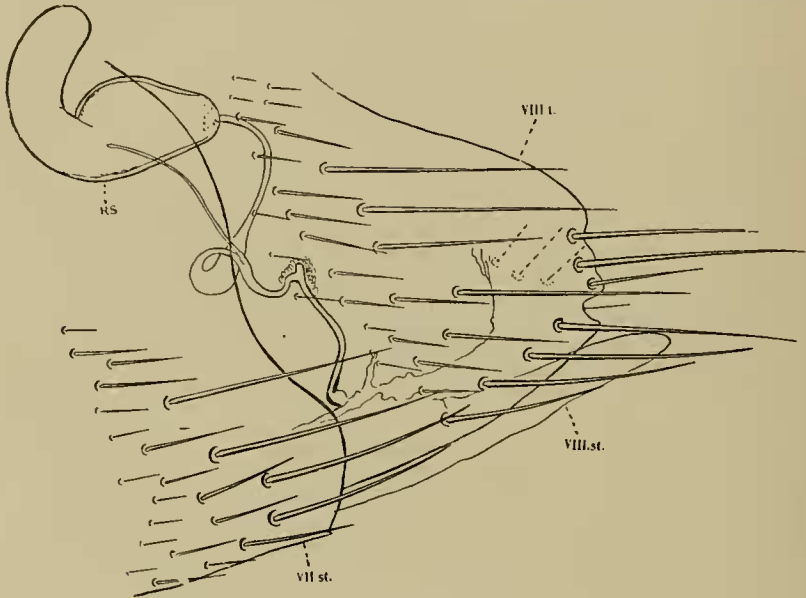


FIG. 39.—*Dinopsyllus cremus*.

row on the sixth tergite. The apical margin of the seventh sternite is more oblique than in the allied species, the sinus being shallow and the upper lobe less prominent.

Length (mounted specimen): 3.8 mm.

1 ♀ from Mt. Mikeno, Belgian Congo, off *Lophuromys* spec.;—type.

1 ♀ from Buhamba, near Lake Kivu, Belgian Congo, June 1, 1911.

1 ♀ from Igembu Hills, British East Africa, February 13, 1911, off *Thamnomys* spec.

37. *Dinopsyllus kemp* spec. nov. (text-fig. 40).

♂. A single specimen of *Dinopsyllus* was found by Mr. Kemp on *Graphiurus microtus saturatus*. This example, though closely agreeing with *D. lypusus* in other respects, is remarkable for its short round frons, which is more like that of a *lypusus* ♀ than a ♂. In this character *D. kemp* comes very near to *D. ellobius* Roths. (1904). The vestigial tubercle is exactly in the centre of the frons (text-fig. 40). The genal process is longer and broader than in *D. apistus*, *lypusus*, and *ellobius*, and the second genal spine (counted from below) slenderer.

The pronotum has a comb of thirty-one spines and bears two rows of bristles. The mesopleura have 20 (21) bristles, the metepimerum bears 17 (18), the basal abdominal sternite 8 (6), and the eighth sternite 36 (38). There are four combs on the abdomen on segments II to V, the numbers of teeth being 7, 8, 8, 8 (7, 9, 10, 5). The seventh tergite bears a row of eighteen long bristles, and only eleven

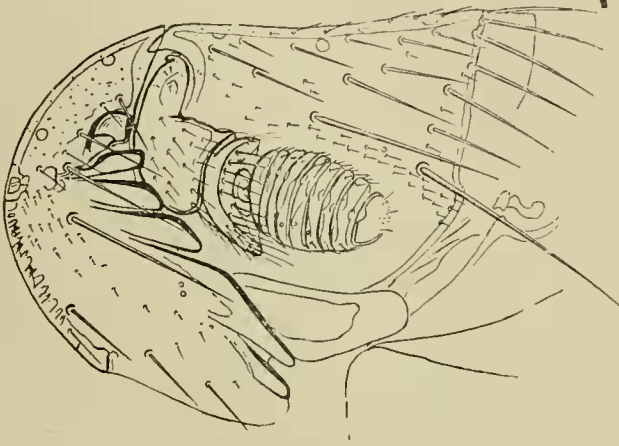


FIG. 40.—*Dinopsyllus kempi*.

additional bristles in front of the row on the two sides together, the numbers on the seventh sternite being eight and twenty-four respectively.

The apical ventral angle of the eighth sternite is less rounded than in *D. lypusus*, but more so than in *D. apistus*, and the two long bristles placed near this angle are farther apart from each other than in the allied species. The ninth sternite bears an apical row of eight bristles, of which two or three are long, then follow two moderately long bristles and farther proximally a row of four or five bristles.

Length (mounted specimen) 3.6 mm.

1 ♂ from Mntaragwa, Aberdare Mts., British East Africa, March 13, 1910, off *Graphiurus microtus saturatus*.

38. *Dinopsyllus ellobius* Roths. (1905).

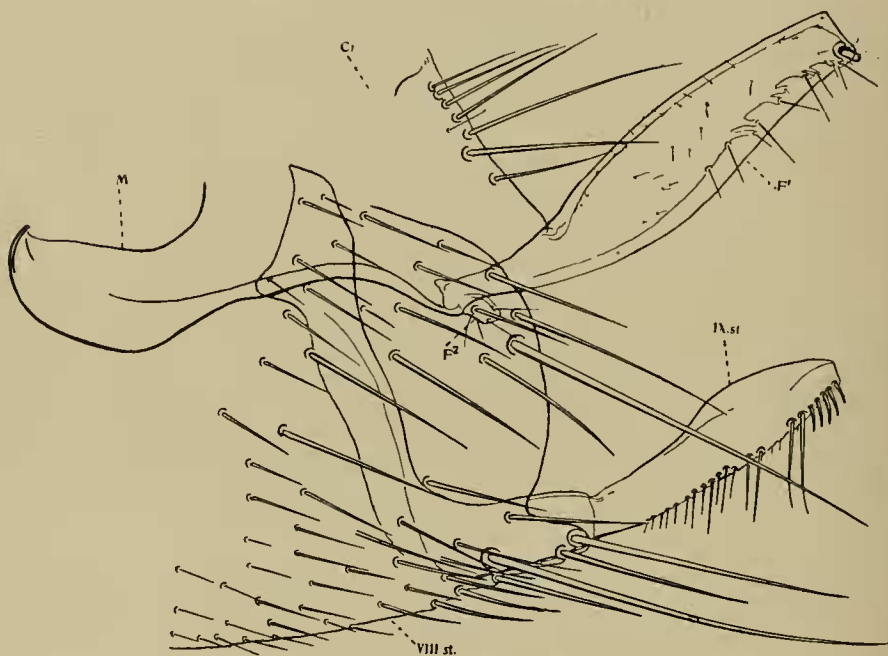
Ctenopsyllus ellobius Rothschild, *Nor. Zool.* xii. p. 490. no. 9. t. 14. fig. 13-15 (1905) (Zululand).

The frons is short and ventrally very broad, the head agreeing best with that of *D. kempi*. The distance between the tip of the lowest genal spine and the frontal oral corner is larger than (♂) or as large as (♀) that between the frontal oral corner and the vestigial frontal tubercle. This tubercle is placed **below** the centre of the frons in both sexes. The eighth sternite of the ♂ is strongly rounded off apically, and the two bristles placed near its ventral apical corner (which is quite effaced) are quite close together.

We take the opportunity of also describing the following species from Angola collected by Dr. Ausorge.

39. *Dinopsyllus horridus* spec. (text-fig. 41).

♂ ♀. A near relation of *D. longifrons*, from which it differs chiefly in the ♂-genitalia. The upper and lower antepygidial bristles are of practically even length in the ♂ as well as the ♀. The last but one genal spine is broader than in *D. longifrons*. Both sexes have three rows of bristles on the pronotum, and a pronotal comb of thirty or thirty-one spines. The mesopleura bear 38 (37) bristles and the metepimerum 32 (33) in both sexes, the basal abdominal sternite having 15 (17) in the ♂, and 23 (23) in the ♀. The eighth sternite has on each side 56 (61) in the ♂, and the eighth tergite below the stigma 39 (41) in the ♀, while the seventh tergite bears on both sides together a row of twenty-three long bristles, and forty-eight additional bristles in the ♂, and sixteen and thirty-six

FIG. 41.—*Dinopsyllus horridus*.

respectively in the ♀, the numbers of bristles on the seventh sternite being in the ♂ 11 + 41, and in the ♀ 20 + 63. The species has a comb on the first abdominal tergite in both sexes, the spines in the other abdominal combs being in the ♂ 2, 7, 8, 9, 3 (1, 8, 8, 9, 3) and in the ♀ 2, 8, 9, 8, 0 (2, 7, 8, 8, 0).

The ninth tergite (text-fig. 41) of the ♂ has six or seven long bristles at the oblique distal margin. The long process of the clasper is less widened in the middle than in *D. longifrons*, and its upper distal angle a little less prominent. The ninth sternite (IX. st.) is much slenderer distally than in any of the other species, and bears a dense comb of bristles from the apex to the centre, the series being interrupted twice (text-fig. 41).

Length (mounted specimens): ♂ 3.5 mm., ♀ 4.3 mm.

1 ♂ and 1 ♀ from Pedreira, Angola, November 12, 1904, off *Petromys campanae*, collected by Dr. W. J. Ansorge.

The ♀ specimen bears on the sixth abdominal segment a long and stout apical bristle corresponding to the antepygial bristles of the seventh segment. The apical margin is sinuate where this bristle is placed.

40. *Dinopsyllus ingens* Roths. (1900).

Typhlopsylla ingens Rothschild, *Ent. Rec.* xii, p. 37, t. 2, fig. 4 (1900) (Cape Colony).

A strongly modified species. The combs of the head and abdomen have almost disappeared, while the bristles, particularly those on the legs, are more numerous and longer than in any other species of *Dinopsyllus*. The species is only known from South Africa.

Key to the species of *Dinopsyllus*:

I. Surface of body densely reticulated; five genal spines.

a. Comb of third abdominal segment containing at least eight spines, metepimerum with at least thirty-five bristles. *D. echinus* spec. nov.

Comb of third abdominal segment containing three spines, metepimerum with twenty-seven or less bristles . . . *D. hirsutus* Roths. (1908)

II. Surface of body with dorso-ventral lines; five genal spines.

A. ♂♂ (not known of *eremus*).

b. Vestigial frontal tubercle in or below centre of frons *c.*

" " " above centre of frons *d.*

c. The two bristles placed near the ventral distal angle of the eighth sternite close together *D. ellobius* Roths. (1905)

These two bristles widely apart *D. kempii* spec. nov.

d. Long process of clasper curved upwards from base to centre . . .

D. grypurus spec. nov.

The upper and undersides of this process convex *e.*

e. Ventral apical angle of eighth sternite strongly produced; two bristles at tip of angle very close together *D. apistus* spec. nov.

The angle rounded off *f.*

f. The row of bristles on the ninth sternite almost continuous . . .

D. horridus spec. nov.

The row widely interrupted *g.*

g. Combs on second and third abdominal segments with eight or more spines *D. longifrons* spec. nov.

These combs with six or less spines *D. lypusus* spec. nov.

B. ♀♀ (not known of *kempii* and *grypurus*).

h. Head of receptaculum seminis without hump . . . *D. eremus* spec. nov.

" " " with prominent hump *i.*

i. Metepimerum with more than twenty-eight bristles *j.*

" " less than twenty-six " *k.*

j. First abdominal tergite with apical spines . . . *D. horridus* spec. nov.

" " " without apical spines *D. longifrons* spec. nov.

k. Distance from frontal oral angle to tip of first genal spine larger than distance to frontal tubercle *D. ellobius* Roths. (1905)

The former distance shorter than the latter. *D. lypusus* spec. nov. and

D. apistus spec. nov.

III. 9 to 2 genal spines *D. ingens* Roths. (1900)

Hypsophthalmus gen. nov.

♂ ♀. Allied to *Chimaeropsylla*, *Dinopsyllus*, *Palaeopsylla* and *Leptopsylla*. Genal comb vertical. Eye near base of antenna. Labial palpus consisting of four segments. Frons without short stout spiniform bristles near anterior margin. Mandibles slender. One long antepygial bristle accompanied by two very small ones. Vertical lines of metepimerum ventrally not more numerous than dorsally. Hindcoxa on inner surface with a comb or patch of small spiniform bristles. Fifth segment in all tarsi with four pairs of plantar bristles, all lateral.

Genotype: *H. campestris* spec. nov.

We also place here the species described as *Ctenopsyllus aganippes* Roths. (1902) and *Ctenopsyllus granti* Roths. (1904), both from the Cape Colony. The three species agree in the characters mentioned above, but differ *inter se* so widely in other structures that they may ultimately be classified under different genera.

41. **Hypsophthalmus campestris** spec. nov. (text-figs. 42, 43 and 44).

♂ ♀. The frons is almost evenly curved, being minutely angulate just below the centre. The structure of the skeleton is different above and below the angle,



FIG. 42.—*Hypsophthalmus campestris* ♀.

as is also the case in *Leptopsylla* (and some other genera). An internal incassation situated below the angle extends from the anterior edge of the frons inwards, terminating and being most strongly chitinised near the base of the last but one genal spine (counted from below). There is a row of six bristles along the frontal edge, one bristle behind the eye, a second in front of the penultimate genal spine, and a third nearly on a level with the most ventral bristle of the anterior row. On the portion of the frons below the angle there are three pale dots, two being placed close to the comb and the third towards the anterior margin. The genal comb contains five spines as in *Dinopsyllus*, the second from below being the longest.

All the spines are rounded at the tip. Above the comb in close proximity to the last spine there is the strongly chitinated eye, which appears to be reduced as regards its function as an organ of sight. The occiput has three rows of bristles. The antennal groove is closed. The bristles on the second segment of the antenna are short in both sexes. The club reaches to the hindmargin of the antennal groove, being very little shorter in the ♀ than in the ♂. The proboscis extends a little beyond the centre of the forecoxa.

Thorax.—The pronotum has one row of bristles and a comb of twelve obtuse spines, the apical lobe situated below the comb being about as wide as two spines taken together. The mesonotum, which is somewhat shorter than the metanotum, bears two rows of bristles, some additional dorsal bristles and a basal row of very small ones, besides some internal subapical setiform spines, of which one is placed a short distance above the ventral angle. The mesopleura have five or six bristles. There are two bristles, one long and one short, on the metepisternum, one on the metasternum, two complete rows and an incomplete one on the metanotum, and six or seven bristles (3, 3 or 4) on the metepimerium. The apical edge of the metanotum is denticulate like the abdominal tergites, but has no spines.

Abdomen.—The tergites bear two rows of bristles, but the anterior row is only represented by a few bristles on the posterior segments. One bristle is placed below the stigma. The posterior row contains twelve or thirteen bristles on the central segments. Tergites I to IV or V have one or more apical spines. The antepygial bristle is rather short and stumpy. The sternites of segments III to VII in the ♂ and III to VI in the ♀ bear four long bristles on the two sides together, sternite VII of the ♀ seven or eight, there being no small bristles in front of the row.

Legs.—The subapical sinus of the hindcoxa is very shallow, the angle above it being but very slightly prominent. The comb on the inner surface of this coxa consists of six or seven spiniform bristles. All the femora bear in the apical half about half a dozen subdorsal bristles and two ventral subapical ones, there being an additional bristle above and somewhat posterior to the second subapical one on the mid- and hindfemora and two or three lateral ones on the forefemur. The inside of the femora bears a small ventral bristle near the apex and a subventral one (occasionally absent) towards the base. The tibiae are covered on the outside with numerous bristles (about thirty on the hindtibia, apart from those placed at the anterior edge) and their dorsal edge bears five pairs of bristles exclusive of the apical bristles. There are two more single bristles in between the second and third and fourth and fifth pairs respectively. Of the dorsal bristles of the tibiae the outer ones do not form a comb, as in the case of *Leptopsylla* and *Hypsophthalmus aganippes*. The apical bristles of the hindtarsal segments do not extend to the apex of the next segment, the first segment bearing the longest bristle, which nearly reaches to the apical bristle of the second segment. The fourth hindtarsal segment is twice as long as it is broad. The measurements of the tarsi are as follows:

Foretarsus :	♂, 8, 9, 7, 6, 15 ;	♀, 9, 9, 8, 6, 16.
Midtarsus :	♂, 16, 15, 10, 7, 15 ;	♀, 17, 16, 11, 8, 16.
Hindtarsus :	♂, 30, 23, 15, 9, 17 ;	♀, 34, 24, 14, 9, 17.

Modified Segments.—♂. The eighth sternite is much larger than the tergite. Its apical margin is rounded, but the ventral angle is produced (text-fig. 43) and

bears five bristles on the two sides together. The body of the clasper (Cl) is very large. Its distal margin is nearly straight, with the dorsal angle slightly and the

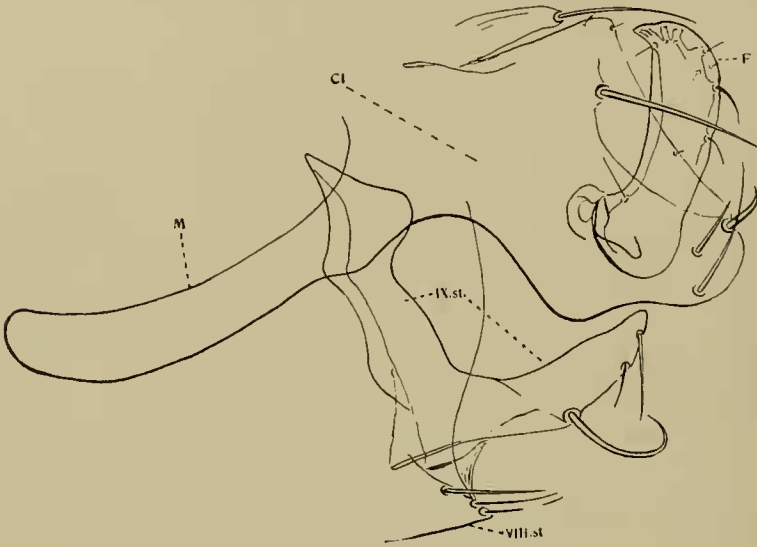


FIG. 43.—*Hypsophthalmus campestris*.

ventral angle strongly rounded. The dorsal margin is placed almost at right angles to the distal one. The clasper is very strongly dilated ventrally from near the base

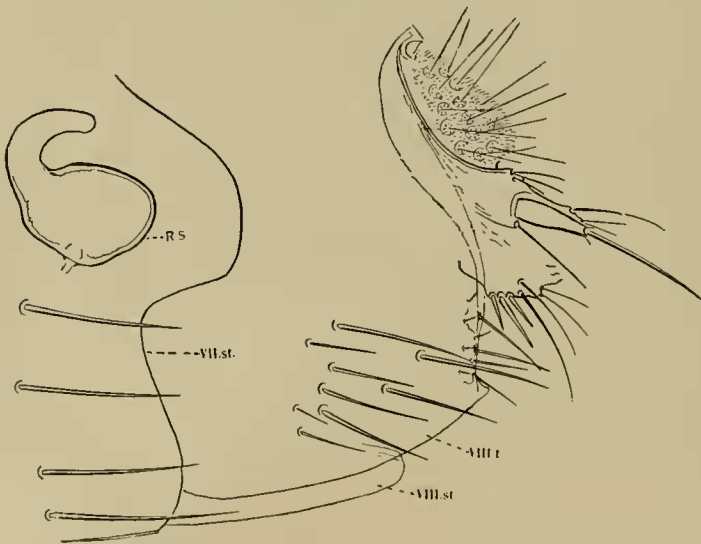


FIG. 44.—*Hypsophthalmus campestris*.

of the manubrium, as shown in the figure, and bears some minute bristles at the dorsal angle, a long one farther down, and a row of three above the rounded ventral

angle. The manubrium is long and has a rounded apex. The internal arm of the肘ed ninth sternite (text-fig. 43, IX. st.) is broad. Its dilated apical portion is rounded on the distal side, while its proximal upper angle is acute, and produced obliquely upward. The horizontal arm is widest in the centre, nearly straight above, almost evenly rounded beneath, and bears on the ventral margin three long bristles, of which the proximal one is large and curves distad, while the other two are thin and point ventrad.—♀. The seventh abdominal sternite (text-fig. 44) has a broad but shallow sinus which diminishes ventrally, the lobe placed above the sinus being very strongly rounded and projecting more than the ventral portion of the segment. The apex of the eighth tergite is truncate-rotundate and bears eight or nine bristles at and near the edge on the inner and outer surfaces together, there being farther proximally on the segment eight or nine more bristles, as shown in the figure (text-fig. 44, VIII. t.). The sensory plate is rather strongly convex. The anal tergite is transversely raised at the base and bears on this elevated portion a row of bristles, another set of bristles placed near the apex of the segment, but none in between the two sets. At the angle below the base of the stylet there is one bristle. The stylet is straight, conical, three times as long as it is broad at the base, and bears two minute bristles at a short distance from the long apical one. The anal sternite has ten bristles, of which one or two are stout. The receptaculum seminis has a large, irregularly-shaped head, which is nearly as broad as it is long, its aperture being ventral (as in *Ctenophthalmus*), not terminal. The tail is about as long as its head.

1 ♂ and 1 ♀ from Kumba, S.W. Uganda, June 30, 1911, off *Otomys* spec.;—type, ♂.

1 ♀ from the Igembu Hills, N.E. of Mt. Kenia, February 13, 1911, off *Thamnomys* spec.

42. *Chimaeropsylla potis* Roths. (1912).

Chimaeropsylla potis Rothschild, *Bull. Ent. Research* ii., p. 270, fig. 1. 2. 3 (1912) (Zomba).

1 ♂ from Shimbo Hills, British East Africa, July 30, 1910, off *Rhynchocyon* spec. Originally described from Nyassaland, where both sexes were found on an elephant shrew, *Rhynchocyon cirnei* Peters.

The species has very broad and strong mandibles, recalling the *Sarcopsyllidae*.

43. *Leptopsylla aethiopicus* Roths. (1908).

Ctenopsyllus aethiopicus Rothschild, in *Sjöstedt, Kilimandjaro-Kenia Exped.*, Siphon. p. 5. t. 1. fig. 8. 9 (1908) (Kibonoto).

1 ♀ from Mutaragwa, Aberdare Mts., British East Africa March 11–14, 1910, off *Thamnomys ibeanus*.

2 ♀ ♀ from Mt. Kenia, British East Africa, January 3, 1911, off *Thamnomys* spec.

1 ♂ from Mt. Mikeno, Belgian Congo, June 7, 1911, off *Thamnomys* spec.